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Improvement of lab productivity and operational efficiency using IoT / M2M

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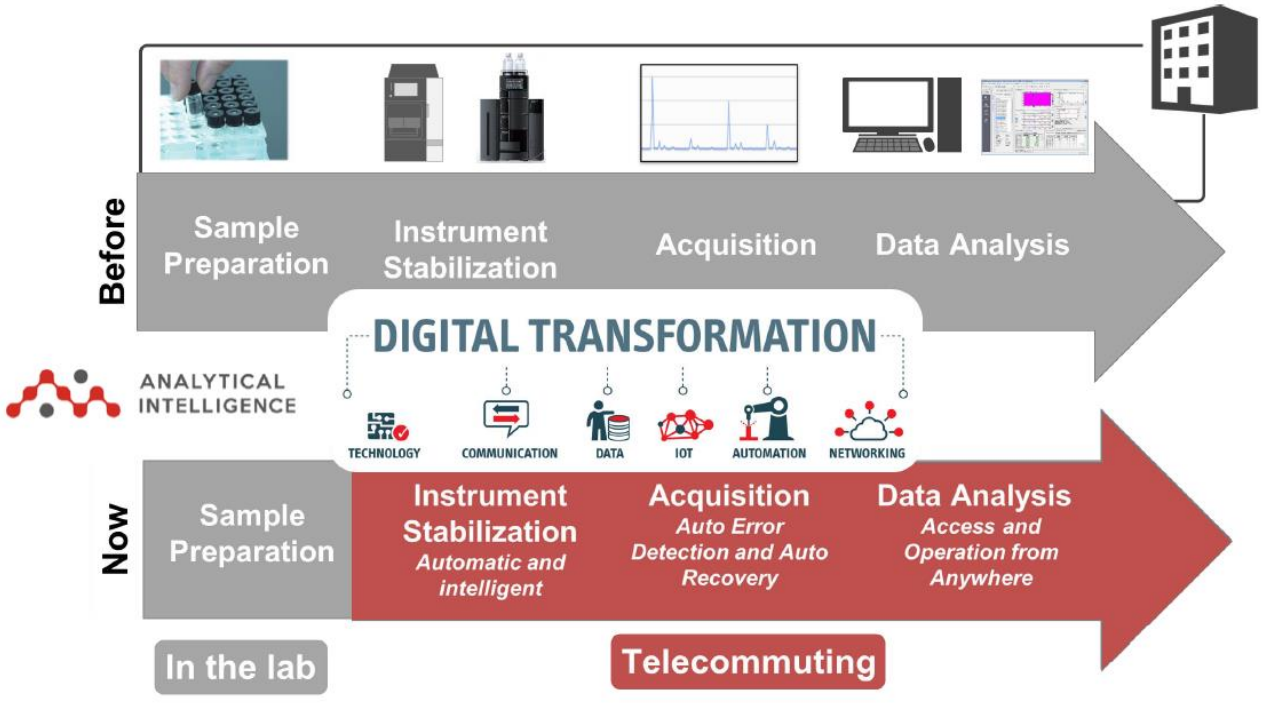
1. INTRODUCTION

In the wake of the Corona virus global pandemic, food laboratories faced the challenge of maintaining operations under critical conditions while ensuring the safety of employees. Under these circumstances, in order to continue daily operations and analytical work (including tasks such as management of consumables, periodic inspections, and troubleshooting protocols in the event of instrument' malfunction or failure), emerging work flows in which operators externally access the analytical data system in a lab through a VPN connection, process data on the server, and create reports have become a necessity. In response to these issues, M2M(machine-to-machine) technology, which enables machines and information systems to exchange information with each other without human intervention, has been applied, allowing personnel to remotely monitor the operating status of instruments and to manage both the instruments and consumables from an external location. Even if instrument's malfunction occurs, the downtime can be reduced by performing a preliminary diagnosis remotely and performing appropriate repairs. Using tools such as IoT(internet-of-things) / AI(Analytical Intelligence), it is possible to improve traditional laboratory operations.
In this presentation, we will discuss the use of IoT / M2M technology to improve lab productivity and operational efficiency in response to the challenges posed by the COVID-19 global pandemic.



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2. AUTOMATIC AND INTELLIGENT INSTRUMENT STABILIZATION, ACQUISITION AND DATA ANALYSIS

There is a series of routine laboratory operations and unexpected events that can negatively impact the lab productivity. Latest IoT / M2M technology and Analytical Intelligence™features implemented into new generation hardware and software allow users and instrument's manufacturers to proactively collaborate for minimizing down time in the laboratory.

1. **Advanced start-up to protect columns** with Smart Flow Control (FlowPilot).
2. **Mobile phase monitoring to prevent shortage.**
3. **Auto Error Detection and Auto Recovery to reduce downtime** (ex. air bubble interfusion causes a drop in the flow rate).
4. **Remote control by Web/VPN Access** with LabSolutions™Direct.
5. **Data processing by virtualization technology/VPN access.**

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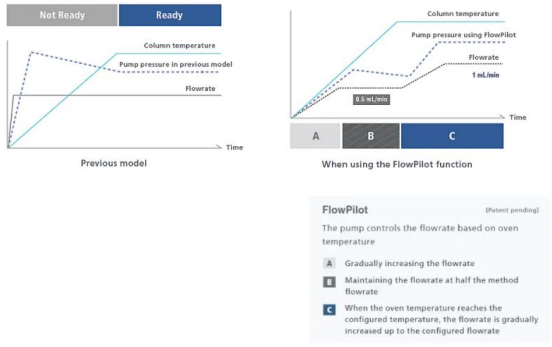

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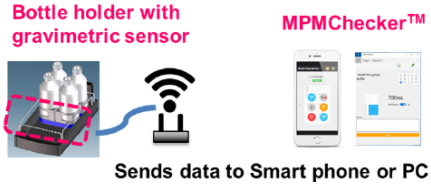

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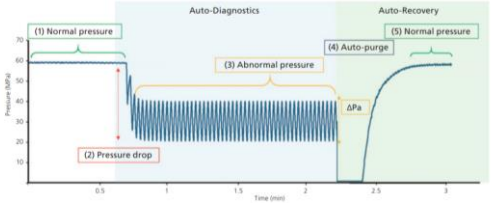

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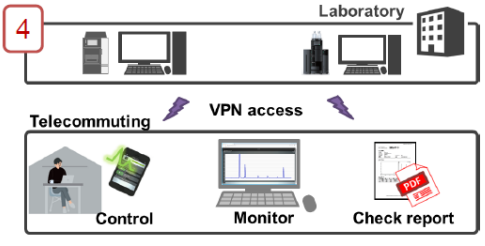

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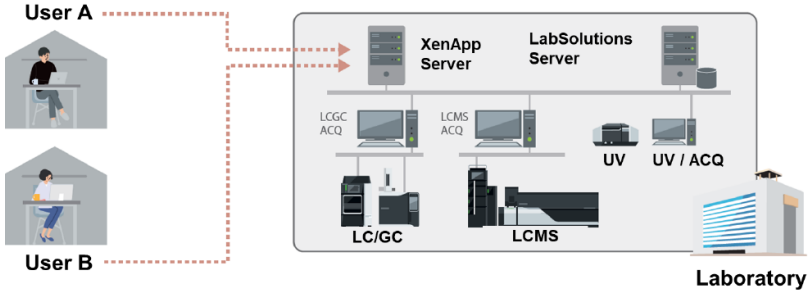
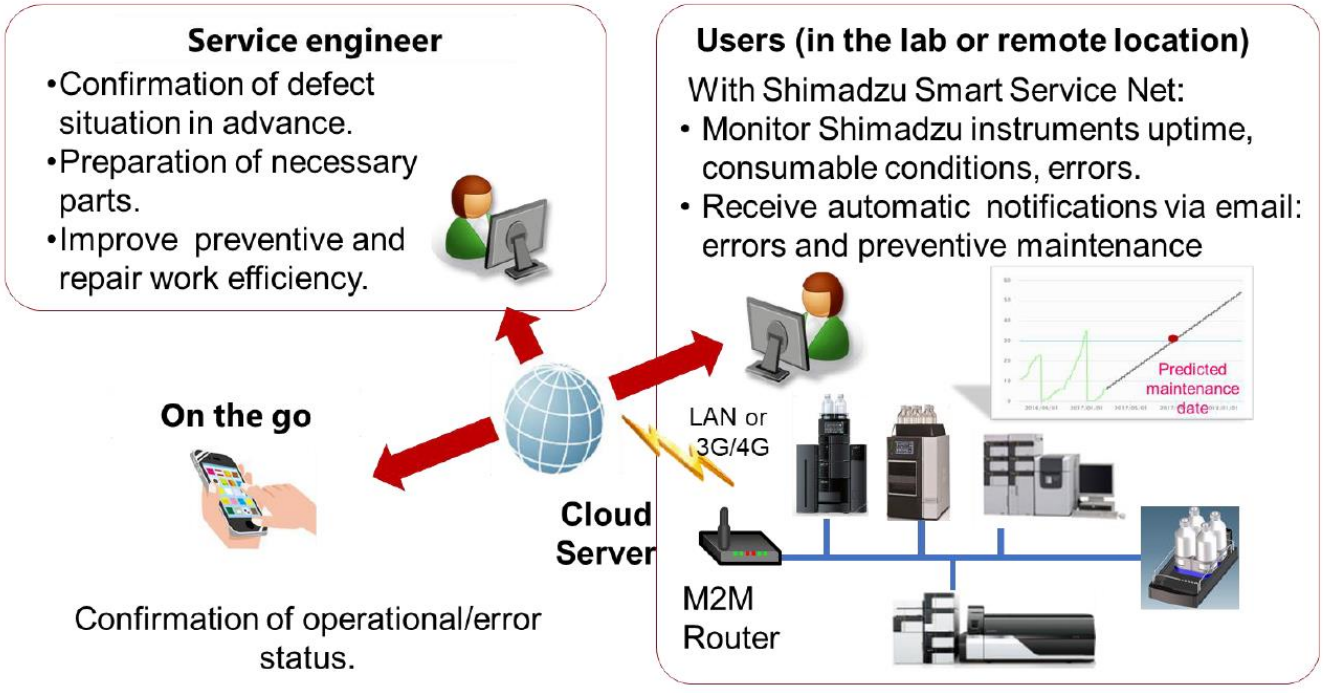


3. REMOTE MAINTENANCE AND TROUBLESHOOTING

IoT / M2M technology is utilized to reduce instrument downtime and manage the cost of assets by automatically collecting the system status, conditions of the consumables, and error logs. Shimadzu Smart Service Net operates via M2M Router and manually or automatically uploads various information, such as errors, output from LabSolutions network systems or analytical instruments via a network to a dedicated Shimadzu site in a data center. An email is sent with notifications, so proper decisions can be made in a timely manner for troubleshooting problems or performing preventive maintenance.



4. CONCLUSION

This poster demonstrates how IoT / M2M technology contributes to the implementation of a modern laboratory workflows and enables increased productivity as:

1.Some demands that rose from the COVID-19 pandemic will persist:
"New Normal" has accelerated improving laboratory productivity and operational efficiency.

2.The key for continued improvement is automation and remote solutions:
Automated support functions utilizing digital technology enable higher productivity and maximum reliability. With the help of Web and virtualization technologies, aextended list of laboratory tasks can be performed remotely.

3.IoT / M2M technology supports sustainable laboratory operation:
This technology allows remotely managing routine operation and maintenance of instruments and consumables. Even troubleshooting and prevention of instrument malfunctions can be optimizedand downtime can be reduced.

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