

SERVICE ADVANTAGES OF A CLOUD-BASED LIMS



Modern day laboratories often find it challenging to zero-in on a Laboratory Information Management System (LIMS) that can enhance their laboratory efficiency, maximize investment returns, and meet their laboratory data management needs of today and tomorrow. Today, LIMS is in the fourth generation of evolution, and laboratories who are using an on-premise LIMS need to upgrade or choose a LIMS that can offer them higher scalability and flexibility at minimal expense. It is worthwhile to choose a cloud-based LIMS that offers a number of service advantages over traditional on-premise LIMS for managing the ever-growing laboratory data. A cloud-based LIMS leverages the power of cloud computing to facilitate users with secure access to LIMS software anytime, anywhere using an Internet-ready device. This white paper underlines the generic service advantages of a cloud-based LIMS for biobanks, clinical research, diagnostic, and food & beverage testing laboratories, etc. so that they can realize the benefits of the most economical LIMS solution.

SOME OF THE SERVICE ADVANTAGES OF CLOUD-BASED LIMS ARE LISTED BELOW

1) **Highly Scalable and Flexible:** One of the key benefits of using cloud technology is its scalability. While searching a LIMS application, it is imperative to choose a LIMS that not only

meets the present day needs but also the future needs of a laboratory. The future needs of a laboratory is usually unseen and can be contrastingly different from the present day needs. Hence, a LIMS should be scalable so that it can adjust to the ever-changing laboratory data management needs. A cloud-based LIMS facilitates laboratories to seamlessly upscale or downscale their IT requirements as and when required.

In contrast to thick-client LIMS, cloud-based thin-client LIMS allows much greater flexibility to the users and are ideal for businesses with growing or fluctuating bandwidth demands. Furthermore, any required changes or modifications done to the LIMS can be easily viewed by authorized users in real time, simply by using web-enabled devices such as smart phones, laptops and notebooks. This saves time and facilitates both internal and external collaboration.

2) **No Need for Expensive Hardware Purchase and IT Personnel:** Cloud-based LIMS eliminates the need to buy, install and upgrade pricey software, or pay large amounts up-front for servers and hardware, and pay salaries to IT personnel. You can simply pay a monthly fee to a cloud provider, freeing up your valuable capital, and converting it into an operational expense. In case of cloud-based LIMS, it is the responsibility of the LIMS supplier to host the LIMS application

and maintain users' data on a secure cloud server. All hardware and other resources needed for enabling users to access the LIMS application is facilitated by the LIMS vendor. Hence, end-users are no longer required to rely on their hired IT personnel for deployment of LIMS, besides eliminating the requirement for expensive hardware infrastructure.

3) Quicker Deployment: Reducing the IT factor means a reduction in deployment time. In contrast to on-premise LIMS, users do not have to wait for implementation of their LIMS product in order to use it. Once purchased, the LIMS vendor sends a web link along with the login credentials for authorized users so that they can instantly start using the LIMS software to manage their data. This implies that users' resources can now be focused on any training or configuration needed for mapping laboratory workflows into the LIMS, shortening the overall time required to Go Live.

4) Enhanced Data Security: There are several cloud service providers on the market such as Amazon Web Services (AWS), Microsoft, IBM, Google etc. Protection of cloud data is the highest priority for most of them since the users' data is stored safely in highly secure data centers. Cloud service providers meet dozens of compliance programs in their infrastructure to ensure data protection, prevent IP address spoofing, shut down port scanning, etc.

Additionally, cloud service providers use industry-standard data encryption technologies to secure data transmission across the web. Breaching all of these security measures is practically impossible. In case LIMS is hosted on the cloud, the cloud service provider, not the LIMS vendor, is solely responsible for security of users' data. Hence, users do not need to be apprehensive about the security of their data.

5) Automatic Software Updates: In case of client-server/on-premise LIMS, the client server is present within the premises of the organization that purchased the LIMS software. Whenever the LIMS vendor releases a new upgrade, they have to notify their customers about it. Subsequently, the customers may need to take aid of their local IT support team to download and install the new LIMS version on their local server and upgrade their database. This is a time consuming task and the time required depends on the size of the installer and database, schedule of the local IT support team, and the level of coordination required between the LIMS vendor and the local IT team. Additionally, there is a risk of faulty deployment of upgrades/fixes. In case of cloud-based LIMS, the LIMS software is hosted on a cloud server, which is usually a virtual server instead of a physical device. Users will no longer have to worry about purchasing, installing, downloading, and updating software. Cloud computing suppliers take care of this —security updates included—thus freeing up

users' time so that they can focus on other important aspects of their research and business. Furthermore, the LIMS software is delivered over the web, which makes cloud-based LIMS accessible 24X7, anytime, anywhere, all year round. LIMS vendors are responsible for product upgrades and for hosting the latest version of the application on the web server. This ensures that users can always access the latest version of the LIMS product using their web browser. Additionally, in contrast to on-premise LIMS, users do not need to pay an annual maintenance fee to avail upgrades.

6) Multitenancy: Multitenancy is a fundamental technology using a single instance of an application that runs on a secure cloud server so that multiple tenants can access it simultaneously. A tenant refers to a group of users (businesses, organizations, etc.) who share a common access to the application with specific privileges granted to each user. The main objective behind multitenancy is to facilitate sharing of IT resources (hardware and software) to offer cost-efficient services, besides ensuring complete privacy of one tenant from the other tenants. Multitenancy is a big advantage of cloud computing. Cloud-based LIMS provides each tenant a personal share of the software instance, thereby enabling them to manage their own laboratory data, assign role based access to different users, configure the product per their needs, all with assured 100% privacy from other

tenants.

7) Platform and OS Agnostic: An application is said to be hardware agnostic if it can run on any computer and is not dependent on hardware configuration such as, processor, hard disk space, installed memory (RAM) etc. Similarly, an application is said to be OS independent if its functionality is not dependent on any OS, for e.g., Windows (64-bit or 32-bit), Macintosh, Linux etc. In case of cloud-based LIMS, users simply access the LIMS server hosted on the cloud using their web browser. Hence, no hardware or OS specifications are mandatory to be met for seamless functioning of a cloud-based LIMS.

8) Zero-footprint on the Client Computer: A cloud-based thin-client LIMS application imparts zero-footprint on the end-user client computer. This means that no software needs to be pre-installed on the client computer to run the LIMS application. No data is stored on the user's computer hard disk. The entire processing occurs on a secure remote server hosted on the cloud (or Internet) and users can simply access the LIMS application and their data using any web browser on any Internet-ready device.

9) Disaster Recovery: In case of cloud-based LIMS, there is no fear of data loss due to natural calamities and system failures because the data is hosted on the cloud servers. The cloud service

provider performs regular automatic data backups on mirror servers located at different geographical locations. Even if there is malfunctioning of one server, user's data remains safe on the other servers. This enables users to quickly restore their data in the event of natural calamities or man-made errors. Some cloud-based LIMS vendors also facilitate users to perform data backups manually on their computer and restore it whenever needed, thereby users can personally ensure the safety of their data as well. This eliminates the need of purchasing additional hardware or maintaining a secondary data center for storing huge data backups.

10) Unlimited Storage Space: With an exponential increase in the volume of lab data, it is difficult to foresee where the total size of lab data will reach in 2 to 5 years. The hard disk/storage space of the hardware/server is limited for on-premise LIMS. As time passes, users may have to purchase new servers with higher configuration to store and perform backups of the growing data volume, and subsequently transfer data from an old server to a new computer, thereby adding to cost and time.

Cloud is a repository of virtual computer resources. The cloud server on which the LIMS software resides offers users almost unlimited storage space to manage their lab data. It is therefore worthwhile to use a cloud-based LIMS

solution to address present and future lab data management needs.

11) Easy Collaboration Through Real-time Data Sharing: The cloud-based LIMS stimulates agile and real-time collaboration among lab users present at geographically different locations. Before the advent of cloud computing, remote users were unable to collaborate in real time to share their analytical data for e.g., test results. This used to unreasonably increase sample turnaround time. Cloud-based LIMS enables remote users to manage their lab data and view the details of how the experiment was set up, check experimental runs and observed values of different runs, share reports with colleagues etc. at any time and at any place. Furthermore, it reduces manual intervention and facilitates real time sharing of test reports with customers, thus helping labs to win confidence of end-users.

12) Pay-as-you-go (PAYG) Pricing: A major roadblock in case of on-premise LIMS is huge initial investment, even before the software is installed. This is in the form of hefty license fees, expensive hardware purchase, hiring of IT personnel, man-days spent in drawing out RFP/proposal process, and in completing the necessary paperwork to get approval of the purchase. Once the software is installed, a user needs to spend money on maintenance of IT infrastructure, software maintenance/upgrades, besides paying salaries to IT personnel etc.

The cloud-based LIMS, offered as Software as a Service (SaaS), leverages the advantages of a PAYG payment model to eliminate upfront investment, maintenance costs and allows you to be charged only for what you store, thereby reducing Total Cost of Ownership (TCO). In a PAYG model, a user pays subscription fees to

the LIMS vendor for using the application depending on the number of users and the duration of use. Users can cancel the service any time with minimal loss of investment, if it does not meet their needs or they no longer need it. There are no other hidden costs.

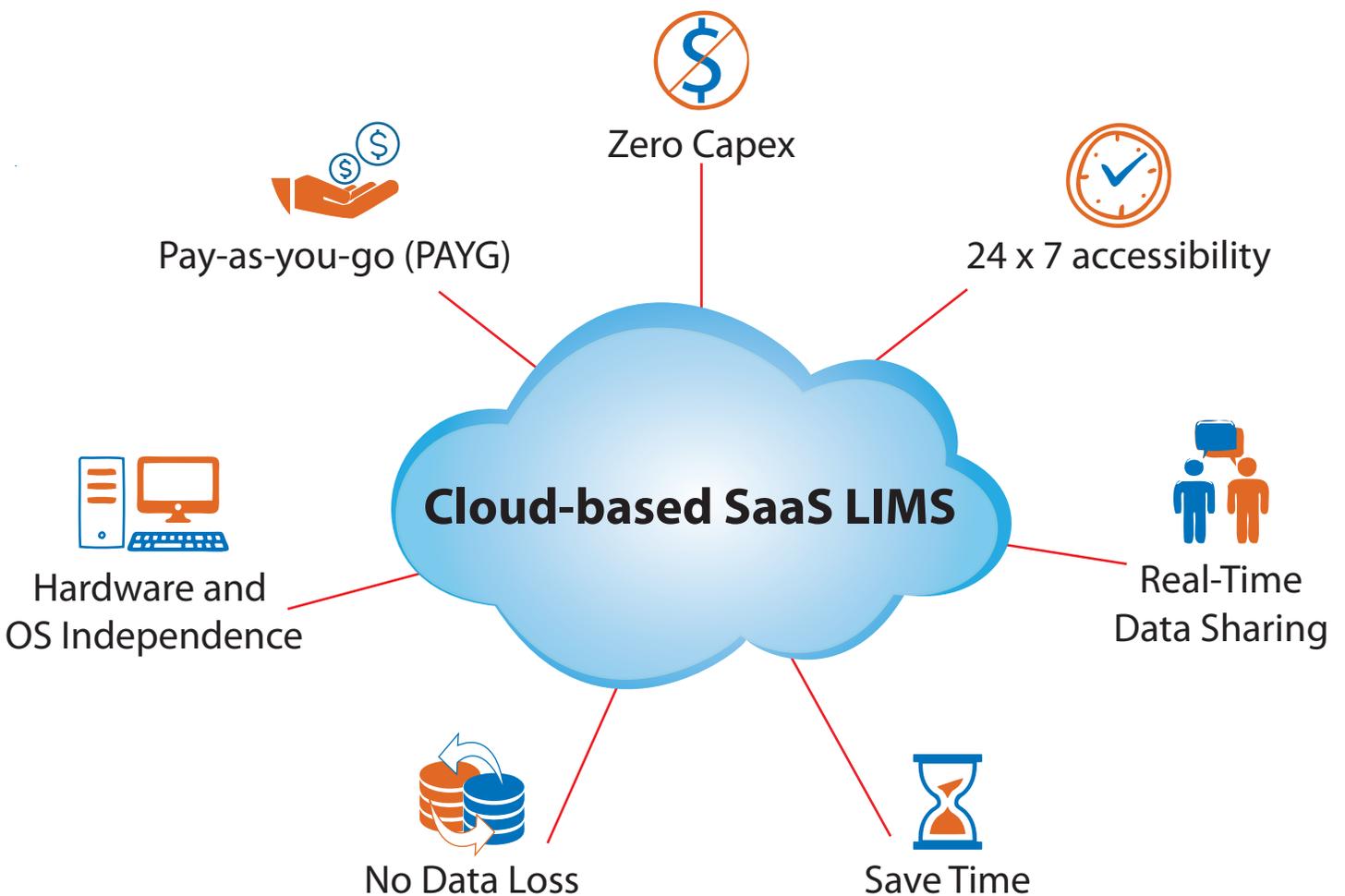


Figure 1: A schematic representation highlighting the advantages of Cloud-based SaaS LIMS.

CONCLUSION

A powerful LIMS tool mitigates the ever increasing laboratory data management challenges by not only effectively managing laboratory data but also by automating laboratory workflows. Affording an on-premise LIMS is a distant dream for small and medium-sized laboratories with meager budgets. Cloud-based LIMS is a powerful cost effective alternative which offers innumerable benefits over traditional on-premise LIMS. Cloud-based LIMS allows laboratories to forgo housing of expensive hardware and associated computers on-premises. Besides, it eliminates the need of hiring of IT personnel for server and software maintenance, upgrades, backup, hosting and security. Security of laboratory data is of paramount importance to lab managers worldwide. For cloud-based LIMS, users' data is hosted on secure remote servers and only authorized personnel can access it using their unique log-in credentials. Furthermore, industry standard data encryption technologies are

adopted by cloud-based LIMS vendors to secure data transmission across the web.

Cloud-based LIMS also offers a higher degree of scalability, thereby facilitating laboratories to upscale or downscale per their requirements. Unlike on-premise LIMS, cloud-based LIMS offers the advantage of data sharing among laboratory members located at different geographical locations in real time. Additionally, SaaS based LIMS offers the advantages of a PAYG pricing model to users so that they can subscribe to the LIMS software, rather than purchasing it. This means that no budgetary outlay is required, unlike an on-premise LIMS, which can run into several thousands of dollars. Owing to the constant need of curtailing expenses, even bigger laboratories with adequate funding are switching to cloud-based LIMS offered as SaaS. Adopting a cloud based LIMS can help laboratories to reduce expenses and they can reap several benefits that cloud-based LIMS offers over on-premises LIMS.