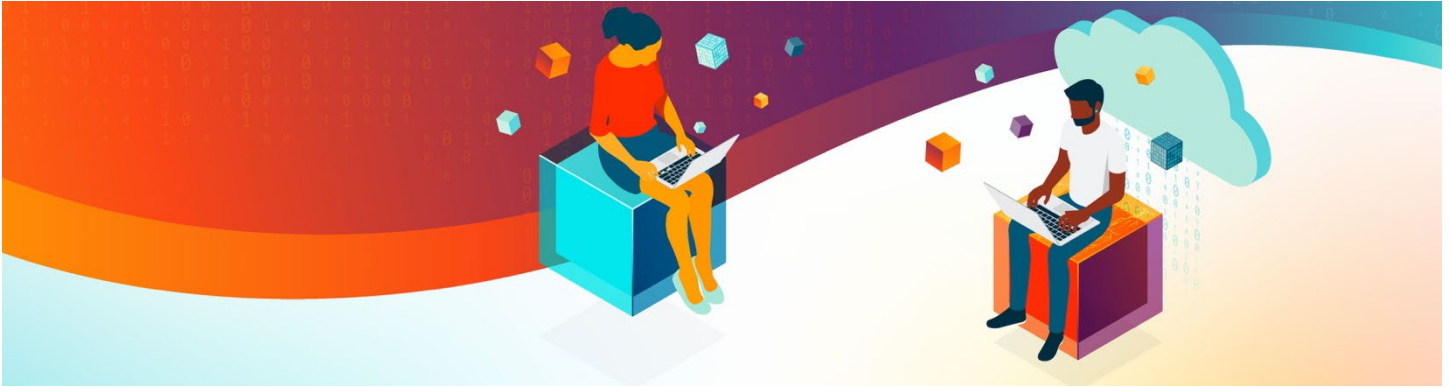


# EVOLVING CARE, EVOLVING DATA: SCALABLE ANALYTICS FOR THE FUTURE OF HEALTHCARE AND LIFE SCIENCES



## Introduction

Many life sciences corporations, healthcare agencies, and other large organizations use the SAS language to develop and deploy data analytics applications, including patient data management, clinical trial preparation, research and development, statistical analysis, regulatory compliance, reporting, and more. Some applications have taken decades to perfect while others continue to be created. Such applications can number in the hundreds of thousands and typically provide high value in critical areas of a business in an industry requiring decades of investment to bring new therapies to market.

Until recently, modernizing a SAS language software environment was synonymous with rewriting all applications into another language. This is no longer the case.

As organizations seek to stay ahead in the evolving data analytics technology landscape, they're exploring how to modernize their SAS language environments without introducing business risk or discarding intellectual property. This white paper will discuss strategies and tools for updating SAS language operations, enabling organizations to improve performance, and integrating modern technologies without the need for costly, risky rip-and-replace. By adopting these solutions, companies can enhance their agility and efficiency in data analytics.

## Key Drivers and Considerations for SAS Modernization

While every organization and situation are unique, there are common motivations for modernizing SAS language environments. These include reducing the total cost of ownership (TCO), adopting flexible licensing terms, accessing a wider pool of internal and external talent familiar with Python, R, and low-code tools, embracing new cloud-native technologies including containerization, and addressing product support life cycle pressure. All this highlights the complexity of the decision-making process.

Life sciences and pharmaceutical companies rely on SAS language applications to do research and to prepare research for submission to regulators. A single solution typically isn't enough to create a full SAS language modernization strategy. When modernizing, large organizations consider factors like regulatory compliance, tolerance for risk, performance, and service level agreements (SLAs). They also weigh costs, budgets, and timelines, along with how easily the new system can be adopted, trained, and resourced by administrators, developers, and users. Additionally, they look at the potential to introduce new capabilities and the potential impact of replacing existing technologies.

# EVALUATING AND SELECTING

## 1 Assess Your Needs

- ▶ Analyze applications, data requirements, performance demands, and team skills.
- ▶ For large datasets or complex analytics, cloud-based solutions can offer scalability.
- ▶ A hybrid approach (on-premises + cloud) can balance flexibility and cost.
- ▶ Integrate Python and R within existing SAS language workflows and broaden users' skills base.



### Three Key Modernization Challenges

1. **People:** Users have varying degrees of willingness and ability to accept new technology. There are likely to be significant training requirements associated with moving to a new technology, language, interface, or platform. Administrators, power users, and IT teams all need training in any replacement scenario. Data analytics in this particular industry has been dominated by the SAS language for decades and this remains the case today.
2. **Process:** Big organizations tend to support large numbers of users and workflows using SAS language applications. Critical processes (like regulatory report generation, drug trial preparation, and pharmaceutical manufacturing) are often subject to multiple levels of government and/or industry regulation. Changing technology can require expensive, time-consuming revalidation. To remain compliant, models and decision-making processes must be transparent and explainable.
3. **Technology:** Core technical capabilities of the SAS language include access to and consumption of data, along with the development and execution of models that produce recommendations and/or decisions. The organization must maintain high levels of reliability, resilience, traceability, scalability, elasticity, performance, and cost effectiveness.

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## Consider Cost and Scalability

- ▶ Choose a stack that fits your current budget and assists future growth.
- ▶ Control licensing, infrastructure, and maintenance costs.
- ▶ Ensure the stack can evolve with emerging technologies to avoid expensive future migrations.



### Technology Considerations

When modernizing SAS, several technology factors need careful attention.

Program design and business logic is the most obvious technical challenge when looking to modernize any computer program. A change in programming language requires complete understanding of the functional requirements and the building of a set of validation tests to ensure that the translated program behaves in exactly the same way. This is very difficult, particularly as there tends to be little or no technical reference material including functional specification, code reference manual, or test suite in business situations. Even if there is such material, it is often risky to rely on the accuracy with the only true reference being the code itself.

Data storage plays a crucial role in performance. How and where data is stored – files, database systems, local, remote, distributed systems, or the cloud – impacts run time. For example, data files might reside in departmental file shares or S3 cloud storage. Data may live in Hadoop, Databricks, Snowflake, or one of many emerging database platforms.

An important consideration are the SLAs in place between different stakeholders, such as business users, IT teams, external customers, partners, and regulators. For instance, business users may have time-sensitive expectations for machine learning models, while regulators may require specific output formats. Customers might be paying for regular delivery of certain reports or APIs.

SAS language performance is also a critical factor. Well-designed SAS language applications are typically fast and efficient, but shifting technologies require an understanding of the potential impact on throughput and performance. SAS language applications are generally resource efficient, making optimal use of CPU, memory, and bandwidth. Transitioning to R or Python may require significantly more CPU time and memory, especially since these languages often need to load all data into memory and algorithms may not be highly optimized.

Licensing and environment must be factored in when moving from on-premises to cloud-based systems. This can involve navigating existing licensing restrictions such as those between on-premises and cloud deployments or across geographic regions, as well as potential upgrades or reconfigurations needed for compatibility with new technologies. Estimating data volumes, network ingress/egress, and processing capacity is essential in ensuring smooth deployment.

## **TOOLS AND TECHNOLOGIES**

### **1 Hybrid Architectures**

Combine the SAS, Python, and R languages for flexibility and exchange data seamlessly between different languages.

### **2 Cloud-Native Services**

Cloud platforms can offer scalable storage and computing, as well as support for advanced analytics and machine learning.

### **3 Containers and Orchestration**

Use Docker and Kubernetes for efficient deployment and management of SAS language workloads together with Python and R, ensuring consistency across environments.



#### **Selecting the Right Technology Stack for Your Organization**

When selecting a technology stack for SAS language modernization, it's crucial to assess data needs, performance requirements, and staff skills. For handling large data volumes, cloud-based platforms may be ideal for scalability although the cost may be high. Alternatively, a hybrid approach combining on-premises and cloud services could provide flexibility and cost control. Consider also the skills of your team; leveraging tools like Python or R could save on training for new recruits, while retaining the SAS language for established teams and processes may be best.

Unsurprisingly, cost and scalability are key factors in any decision. Choose technology that fits your budget while allowing for future evolution. Consider licensing, infrastructure, and maintenance costs, along with scalability. It's important to select a stack that can evolve with emerging technologies to minimize costly future migrations. The right choice should support your immediate needs and help you achieve long-term goals.

#### **Tools and Technologies for SAS Modernization**

When modernizing your SAS language environment, choosing the right tools and technologies is vital. One popular option is using a hybrid architecture that combines the strengths of the SAS language with less mature languages like Python and R. These newer languages are widely supported, allowing organizations to tap into a broad ecosystem of data science and machine learning libraries.

By integrating these languages with existing SAS language applications, businesses can enhance capabilities without abandoning skilled teams and discarding high-value intellectual property.

Cloud-native technologies also play a key role in modernization. Leveraging cloud platforms can offer significant benefits in terms of scalability, performance, and cost efficiency. Cloud platforms provide flexible storage and computing power, allowing organizations to handle large datasets and complex analytics as needed. Moreover, cloud providers offer a variety of advanced analytics and machine learning technologies that can be integrated into existing workflows.

An important consideration is the use of containerization and orchestration technologies such as Docker and Kubernetes. These technologies enable efficient deployment and management of SAS language applications as well as many other applications, ensuring consistency across environments and simplifying the scaling process. By using containers, organizations can package SAS language applications alongside dependencies, making them easier to deploy, whether on-premises or in the cloud. This flexibility supports smoother integration with other technologies and allows businesses to more effectively manage their SAS language environment.

### Altair's Modernization Solution

For organizations looking for a seamless path to modernizing their SAS language environment, new options can help retain existing intellectual property and applications while modernizing. One option is Altair SLC™, which provides a SAS language environment that allows businesses to switch technology providers without discarding their valuable applications and processes. This makes it possible to adopt a new, modern infrastructure with hooks into modern technology while continuing to leverage existing applications and processes – thus helping them minimize disruption and retain the value of prior IP investment.

Migrating to Altair SLC is straightforward, with minimal retraining required for teams and a low risk of disruption. Unlike other rip-and-replace solutions that require extensive resource allocations for performance improvements, Altair SLC operates with efficiency, consuming fewer resources and reducing costs. The solution also provides flexible licensing terms, which can be tailored to meet an organization's specific needs. By offering a solution that integrates with Python, R, and other modern tools, Altair SLC enables businesses to future-proof their analytics capabilities while optimizing performance across diverse environments, including the cloud.

### Use Cases

Let's explore three example use cases of Altair SLC migrations:

#### Example 1:

Company: A pharmaceuticals organization is looking to optimize its quality control and supply chain.

The Challenge: The company uses SAS language to monitor the manufacturing process, identify potential quality and consistency issues, and forecast demand and plan production. They are looking to cut costs and migrate workloads to the cloud.

Solution: Migrate workloads to Altair SLC running in AWS, Azure, or GCP while leaving existing application code unchanged.

#### Example 2:

Company: A big life sciences company has many historical, active, and planned trials based on the SAS language.

The Challenge: The company wants to use some R in the future and plan for a low-risk transition to using more open-source technologies. Ongoing cost is important, but minimizing risk is the top priority.

Solution: Move to Altair SLC within a modern, containerized statistical compute environment (SCE) in order to run existing trial code. Additionally, use Altair SLC's interoperability features to incorporate R code and libraries into new trial code. This makes use of SAS language libraries where needed and allows R developers to benefit from existing trusted, tested IP assets.

## Conclusion

SAS remains the dominant programming language used in life science for developing drugs and submission to regulators. Modernizing SAS language environments presents a unique challenge for many life sciences organizations, particularly those with large, critical or regulated applications embedded in their business processes. However, as data analytics continues to evolve, adopting a flexible, scalable, open approach to technology brings considerable benefits, albeit within the constraints of a highly regulated industry. The key to successful modernization lies in balancing the preservation of existing investment in teams and applications with the integration of more recent technologies like Python, R, and cloud-native services.

By carefully considering drivers for migration, evaluating the right technology stack, and choosing tools that align with current and future goals, organizations can enhance data operations with reduced risk of disruption. Whether it's through hybrid architectures, cloud integration, or containerization, the right modernization strategy enables organizations to remain competitive in a rapidly changing landscape. As the demand for efficient, future-proof data analytics grows, companies that embrace thoughtful modernization will be better equipped to meet both present and future challenges.