

= SAS (software) =

SAS (Statistical Analysis System) is a software suite developed by SAS Institute for advanced analytics , multivariate analyses , business intelligence , data management , and predictive analytics .

SAS was developed at North Carolina State University from 1966 until 1976 , when SAS Institute was incorporated . SAS was further developed in the 1980s and 1990s with the addition of new statistical procedures , additional components and the introduction of JMP . A point @-@ and @-@ click interface was added in version 9 in 2004 . A social media analytics product was added in 2010 .

= = Technical overview and terminology = =

SAS is a software suite that can mine , alter , manage and retrieve data from a variety of sources and perform statistical analysis on it . SAS provides a graphical point @-@ and @-@ click user interface for non @-@ technical users and more advanced options through the SAS programming language . In order to use Statistical Analysis System , Data should be in an Excel table format or SAS format . SAS programs have a DATA step , which retrieves and manipulates data , usually creating a SAS data set , and a PROC step , which analyzes the data .

Each step consists of a series of statements . The DATA step has executable statements that result in the software taking an action , and declarative statements that provide instructions to read a data set or alter the data 's appearance . The DATA step has two phases , compilation and execution . In the compilation phase , declarative statements are processed and syntax errors are identified . Afterwards , the execution phase processes each executable statement sequentially . Data sets are organized into tables with rows called " observations " and columns called " variables " . Additionally , each piece of data has a descriptor and a value .

The PROC step consists of PROC statements that call upon named procedures . Procedures perform analysis and reporting on data sets to produce statistics , analyses and graphics . There are more than 300 procedures and each one contains a substantial body of programming and statistical work . PROC statements can also display results , sort data or perform other operations . SAS Macros are pieces of code or variables that are coded once and referenced to perform repetitive tasks .

SAS data can be published in HTML , PDF , Excel and other formats using the Output Delivery System , which was first introduced in 2007 . The SAS Enterprise Guide is SAS ' point @-@ and @-@ click interface . It generates code to manipulate data or perform analysis automatically and does not require SAS programming experience to use .

The SAS software suite has more than 200 components Some of the SAS components include :

= = History = =

= = = Origins = = =

The development of SAS began in 1966 after North Carolina State University re @-@ hired Anthony Barr to program his analysis of variance and regression software so that it would run on IBM System / 360 computers . The project was funded by the National Institute of Health and was originally intended to analyze agricultural data to improve crop yields . Barr was joined by student James Goodnight , who developed the software 's statistical routines , and the two became project @-@ leaders . In 1968 , Barr and Goodnight integrated new multiple regression and analysis of variance routines . In 1972 , after issuing the first release of SAS , the project lost its funding . According to Goodnight , this was because NIH only wanted to fund projects with medical applications . Goodnight continued teaching at the university for a salary of \$ 1 and access to mainframe computers for use with the project , until it was funded by the University Statisticians of

the Southern Experiment Stations the following year . John Sall joined the project in 1973 and contributed to the software 's econometrics , time series , and matrix algebra . Another early participant , Carroll G. Perkins , contributed to SAS ' early programming . Jolayne W. Service and Jane T. Helwig created SAS ' first documentation .

The first versions of SAS were named after the year in which they were released . In 1971 , SAS 71 was published as a limited release . It was used only on IBM mainframes and had the main elements of SAS programming , such as the DATA step and the most common procedures in the PROC step . The following year a full version was released as SAS 72 , which introduced the MERGE statement and added features for handling missing data or combining data sets . In 1976 , Barr , Goodnight , Sall , and Helwig removed the project from North Carolina State and incorporated it into SAS Institute , Inc .

== Development ==

SAS was re @-@ designed in SAS 76 with an open architecture that allowed for compilers and procedures . The INPUT and INFILE statements were improved so they could read most data formats used by IBM mainframes . Generating reports was also added through the PUT and FILE statements . The ability to analyze general linear models was also added as was the FORMAT procedure , which allowed developers to customize the appearance of data . In 1979 , SAS 79 added support for the CMS operating system and introduced the DATASETS procedure . Three years later , SAS 82 introduced an early macro language and the APPEND procedure .

SAS version 4 had limited features , but made SAS more accessible . Version 5 introduced a complete macro language , array subscripts , and a full @-@ screen interactive user interface called Display Manager . In 1985 , SAS was rewritten in the C programming language . This allowed for the SAS ' Multivendor Architecture that allows the software to run on UNIX , MS @-@ DOS , and Windows . It was previously written in PL / I , Fortran , and assembly language .

In the 1980s and 1990s , SAS released a number of components to complement Base SAS . SAS / GRAPH , which produces graphics , was released in 1980 , as well as the SAS / ETS component , which supports econometric and time series analysis . A component intended for pharmaceutical users , SAS / PH @-@ Clinical , was released in the 1990s . The Food and Drug Administration standardized on SAS / PH @-@ Clinical for new drug applications in 2002 . Vertical products like SAS Financial Management and SAS Human Capital Management (then called CFO Vision and HR Vision respectively) were also introduced . JMP was developed by SAS co @-@ founder John Sall and a team of developers to take advantage of the graphical user interface introduced in the 1984 Apple Macintosh and shipped for the first time in 1989 . Updated versions of JMP were released continuously after 2002 with the most recent release being from 2012 .

SAS version 6 was used throughout the 1990s and was available on a wider range of operating systems , including Macintosh , OS / 2 , Silicon Graphics , and Primos . SAS introduced new features through dot @-@ releases . From 6 @. 06 to 6 @. 09 , a user interface based on the windows paradigm was introduced and support for SQL was added . Version 7 introduced the Output Delivery System (ODS) and an improved text editor . ODS was improved upon in successive releases . For example , more output options were added in version 8 . The number of operating systems that were supported was reduced to UNIX , Windows and z / OS , and Linux was added . SAS version 8 and SAS Enterprise Miner were released in 1999 .

== Recent history ==

In 2002 , the Text Miner software was introduced . Text Miner analyzes text data like emails for patterns in Business Intelligence applications . In 2004 , SAS Version 9 @. 0 was released , which was dubbed " Project Mercury " and was designed to make SAS accessible to a broader range of business users . Version 9 @. 0 added custom user interfaces based on the user 's role and established the point @-@ and @-@ click user interface of SAS Enterprise Guide as the software 's primary graphical user interface (GUI) . The Customer Relationship Management (CRM) features

were improved in 2004 with SAS Interaction Management . In 2008 SAS announced Project Unity , designed to integrate data quality , data integration and master data management .

SAS sued World Programming , the developers of a competing implementation , World Programming System , alleging that they had infringed SAS 's copyright in part by implementing the same functionality . This case was referred from the United Kingdom 's High Court of Justice to the European Court of Justice on 11 August 2010 . In May 2012 , the European Court of Justice ruled in favor of World Programming , finding that " the functionality of a computer program and the programming language cannot be protected by copyright . "

A free version was introduced for students in 2010 . SAS Social Media Analytics , a tool for social media monitoring , engagement and sentiment analysis , was also released that year . SAS Rapid Predictive Modeler (RPM) , which creates basic analytical models using Microsoft Excel , was introduced that same year . JMP 9 in 2010 added a new interface for using the R programming language from JMP and an add @-@ in for Excel . The following year , a High Performance Computing appliance was made available in a partnership with Teradata and EMC Greenplum . In 2011 , the company released Enterprise Miner 7 @.@ 1 . The company introduced 27 data management products from October 2013 to October 2014 and updates to 160 others . At the 2015 SAS Global Forum , it announced several new products that were specialized for different industries , as well as new training software .

= = Software products = =

As of 2011 SAS 's largest set of products is its line for customer intelligence . Numerous SAS modules for web , social media and marketing analytics may be used to profile customers and prospects , predict their behaviors and manage and optimize communications . SAS also provides the SAS Fraud Framework . The framework 's primary functionality is to monitor transactions across different applications , networks and partners and use analytics to identify anomalies that are indicative of fraud . SAS Enterprise GRC (Governance , Risk and Compliance) provides risk modeling , scenario analysis and other functions in order to manage and visualize risk , compliance and corporate policies . There is also a SAS Enterprise Risk Management product @-@ set designed primarily for banks and financial services organizations .

SAS ' products for monitoring and managing the operations of IT systems are collectively referred to as SAS IT Management Solutions . SAS collects data from various IT assets on performance and utilization , then creates reports and analyses . SAS ' Performance Management products consolidate and provide graphical displays for key performance indicators (KPIs) at the employee , department and organizational level . The SAS Supply Chain Intelligence product suite is offered for supply chain needs , such as forecasting product demand , managing distribution and inventory and optimizing pricing . There is also a " SAS for Sustainability Management " set of software to forecast environmental , social and economic effects and identify causal relationships between operations and an impact on the environmental or ecosystem .

SAS has product sets for specific industries , such as government , retail , telecommunications and aerospace and for marketing optimization or high @-@ performance computing .

= = Comparison to other products = = =

In a 2005 article for the Journal of Marriage and Family comparing statistical packages from SAS and its competitors Stata and SPSS , Alan C. Acock wrote that SAS programs provide " extraordinary range of data analysis and data management tasks , " but were difficult to use and learn . SPSS and Stata , meanwhile , were both easier to learn (with better documentation) but had less capable analytic abilities , though these could be expanded with paid (in SPSS) or free (in Stata) add @-@ ons . Acock concluded that SAS was best for power users , while occasional users would benefit most from SPSS and Stata . A comparison by the University of California , Los Angeles , gave similar results .

Competitors such as Revolution Analytics and Alpine Data Labs advertise their products as

considerably cheaper than SAS '. In a 2011 comparison , Doug Henschen of InformationWeek found that start @-@ up fees for the three are similar , though he admitted that the starting fees were not necessarily the best basis for comparison . SAS ' business model is not weighted as heavily on initial fees for its programs , instead focusing on revenue from annual subscription fees .

= = Adoption = =

According to IDC , SAS is the largest market @-@ share holder in " advanced analytics " with 35 @. @ 4 percent of the market as of 2013 . It is the fifth largest market @-@ share holder for business intelligence (BI) software with a 6 @. @ 9 % share and the largest independent vendor . It competes in the BI market against conglomerates , such as SAP BusinessObjects , IBM Cognos , SPSS Modeler , Oracle Hyperion , and Microsoft BI . SAS has been named in the Gartner Leader 's Quadrant for Data Integration Tools and for Business Intelligence and Analytical Platforms . A study published in 2011 in BMC Health Services Research found that SAS was used in 42 @. @ 6 percent of data analyses in health service research , based on a sample of 1 @, @ 139 articles drawn from three journals .