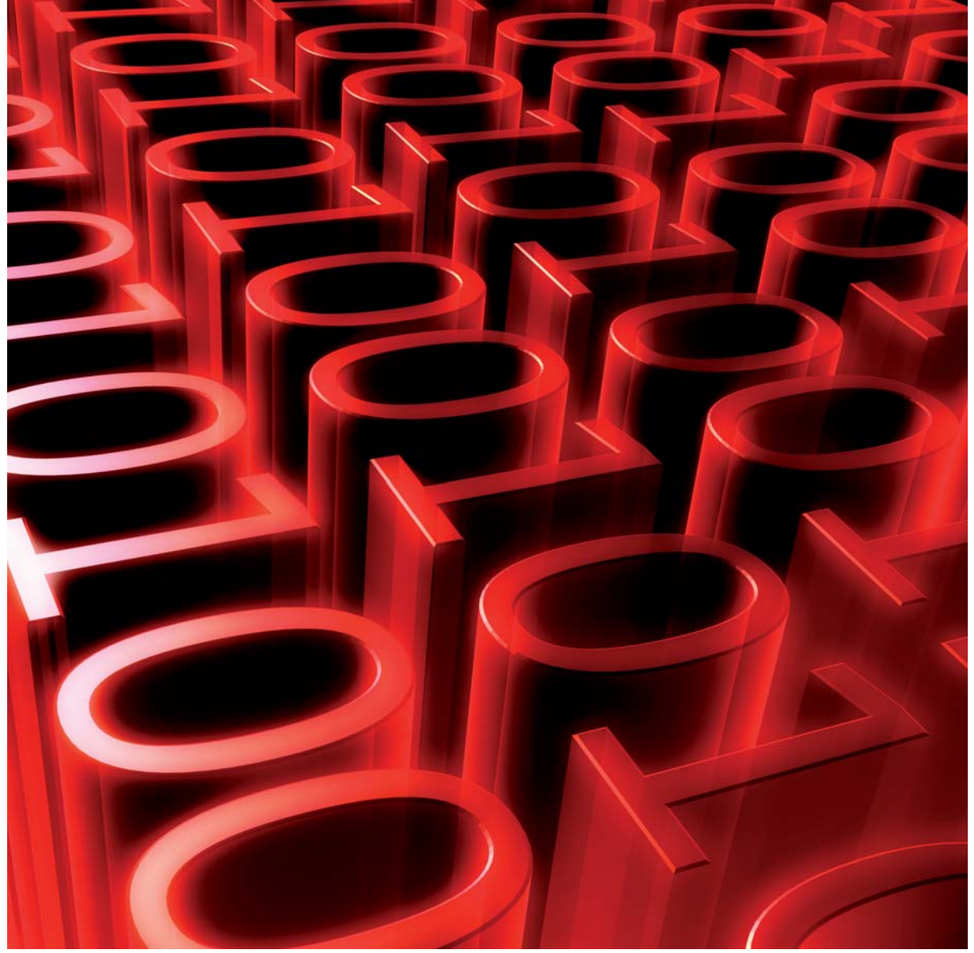
Mind your language



In 1954 a team at IBM lead by John Backus began working on the first high level programming language. John asked his manager if he could be allowed to look for a better way of programming. It was called Formula Translator — FORTRAN for short. A six-month timetable for completion became nearly three years before the first compiler was announced to the computing world at the Western Joint Computer Conference held in Los Angeles, California, in February 1957. In mid-April 1957 the first documented delivery of the FORTRAN I compiler, for the IBM 704, took place to Westinghouse-Bettis.

Peter Crouch, chairman of the BCS Fortran Specialist Group, looks at 50 years of the programming language.

What emerged was the first language that could claim to be anything approaching high level. It has been described as a cross between pidgin English and algebra. It revolutionized programming, coming at a time when programmers worked in binary, setting up strings of ones and zeros, or at best in very low level assembly languages. It was designed to be easy for scientists and engineers to learn so that they could readily program their own problems on to a computer.

FORTRAN II appeared for the 704 in June 1958 and later in the year for the 709 and 650. FORTRAN II introduced subroutines and the common block, amongst other things.

The first FORTRAN system on a non-IBM machine was ALTAC, an extended FORTRAN II, on the Philco 2000 in 1960. The first system called FORTRAN on a non-IBM machine was FORTRAN I on a Univac SS80 in 1961. By 1961 IBM had eight different compilers on different systems and already language variations were causing such problems that IBM issued a manual contrasting the facilities in the eight compilers. A paper in Datamation in 1964 noted that 43 compilers existed in total. Fortran compilers are now available for computers of all sizes, from home PCs and Macs to supercomputers.

The efficiency of FORTRAN compilers has always been a major feature. FORTRAN compilers generated programs that ran as efficiently or very nearly as efficiently as the ones painstakingly hand coded over many days or weeks by the programming elite. This led to huge investment in FORTRAN code.

In addition, its long history has led to the development of extensive mathematical and engineering libraries and specialist compilers for high performance computing on a wide range of parallel and supercomputers.

The first meeting of what was to become the American FORTRAN standards committee J3 was held in May 1962. FORTRAN was the first programming language to be standardized, in 1966 with the publication of the first FORTRAN and first programming language standard by the American National Standards Institute, ANSI standard X3.9-1966, now know as FORTRAN 66. This means there has been good portability of programs between computers.

The BCS Fortran Specialist Group has been a UK focus for the development of the language since its formation in 1970. The current convenors (chairmen) of the ISO WG5 committee responsible for the Fortran language and the BSI (UK) Fortran panel are both members of the Fortran SG committee.

For the last few years the group has provided financial support from the Specialist Groups Development Fund to enable several UK representatives to participate in international standardization work who would not otherwise have been able to take part.

The latest version of the ISO/IEC standard 1539 – 1:2004, informally known as Fortran 2003, was published in November 2004. This standard is the culmination of almost a decade's work by representatives from the USA, UK and other countries. It continues the sequence which began in 1966. That document contained 39 pages, the latest version contains 567 pages – such is progress!

Redeveloped for the 21st century

The development of the language over the last 50 years has continued with ease of use by non-computer specialists in mind while incorporating modern features, such as character strings and block IF statements (IF – THEN – ELSE) in FORTRAN 77 and memory allocation at run-time, operations on whole arrays and free form source format in Fortran 90. Fortran 2003 includes several features to support object-oriented programming, a standard way of interfacing with C (previously different compilers required different approaches), and a standard way of accessing operating systems' features.

The arrival of Fortran 2003 means that anyone planning a new development in a scientific domain should strongly consider using Fortran. It is now a language that has been redeveloped for the 21st century.

Current Fortran users include the UK Meteorological Office, the Ministry of Defence, the Atomic Weapons Establishment, oil companies, the aircraft and automobile industries, engineering consultancies, universities, research laboratories and other scientific institutions.

The information used to produce our daily television weather forecasts and for longer term climatic predictions is produced by very large Fortran programs running on supercomputers. It is also used in the finance industry, which does complex calculations to analyze stock market and financial market data. At present the UK has three commercial software companies producing Fortran compilers and related tools.

One of the Met Office climate models, HadSM3, comprising some two million lines of Fortran code, is now being run on many tens of thousands of home PC through the climateprediction.net project. Exploiting public computing in the climate prediction domain was first proposed in *Nature*, in October 1999, by Myles Allen, currently a lecturer in Oxford University's department of Atmospheric, Oceanic & Planetary Physics.

Four years later, Allen's suggestion was finally realized with the public launch of climateprediction.net, jointly funded by the Natural Environment Research Council (NERC) and the Department of Trade and Industry's e-Science programme. Today, climateprediction.net has more than 200,000 participants in more than 150 countries, and has already generated valuable information on likely development patterns for the world's climate.

Almost 25 years ago Pioneer Day was celebrated on 9 June 1982 at the National Computer Conference, held in Houston, Texas, to honour the 25th anniversary of the delivery of the first FORTRAN compiler. As part of the celebration IBM created and displayed an exhibition containing photographs of FORTRAN pioneers, facsimiles of documents, memorabilia, FORTRAN manuals and other publications, as well as a 12-minute film on the history of FORTRAN starring the members of the original FORTRAN development team.

2007 marks the 50th anniversary of the release of the first FORTRAN compiler, as well as the BCS's own 50th anniversary. The Fortran SG and the Computer Conservation Society have organized a meeting to commemorate this major milestone in the history of computing and information technology. It will be held on 25 January 2007 at the BCS London office.

Some of the illustrations and the film from 1982 will form part of the programme of this meeting. Other parts will provide a UK view on the use of Fortran and its development over the last 50 years and into the future, including presentations from some of those involved with climateprediction.net.

(Note: FORTRAN is used here to describe pre-1990 versions of the language and Fortran for the more recent developments.)

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