Newcastle University

Celebrating 50 Years of Campus-wide Computing

The IBM System/360-67 and the Michigan Terminal System

13:30–17:00 Thursday 13 June 2019
Event Space, Urban Sciences Building, Newcastle Helix
Jointly organised by the School of Computing and the IT Service (NUIT)

Two of the most significant developments in the 65 year history of computing at Newcastle University were the acquisition of a giant IBM System/360-67 mainframe computer in 1967, and subsequently the adoption of the Michigan Terminal System. MTS was the operating system which enabled the full potential of the Model 67 – a variant member of the System/360 Series, the first to be equipped with the sort of memory paging facilities that years later were incorporated in all IBM's computers – to be realised.

The pioneering achievements enabled by the Model 67 under MTS include not only a time-sharing service, and interactive usage, but also extensive computer networking facilities, enabling the provision of remote computing services, in particular to Newcastle's partner institutions, Durham University and Newcastle Polytechnic (now Northumbria University). All of these developments were barely imagined by computer users elsewhere in the 60s.

A new permanent display has been created of iconic artefacts, documents, videos and photographs to celebrate these developments. This is an initial contribution to a planned large and ambitious exhibition, The History of Computing at Newcastle University, housed in the Atrium of the Urban Sciences Building, the new home of the School of Computing. This exciting new project will mark Newcastle University's commitment to chronicling and celebrating its computing history.

Speakers

Michael T. Alexander
Senior Systems Research Programmer, and Assistant Research Scientist at the University of Michigan Computing Center (1965-1996), and principal developer of MTS

Jason Bain
Assistant Director Infrastructure,
University IT Service (1991-1993 & 1999-)

Elizabeth Barraclough
NUMAC Computer Manager (1957-1993)

Ewan Page
Director of the Computing Laboratory (1957-1976)

Brian Randell
Professor of Computing Science (1968-)

Programme

13:30 – 13:45 Introduction (John Fitzgerald)
13:45 – 14:00 Ewan Page
14:00 – 14:45 Michael T. Alexander
14:45 – 15:15 Break
15:15 – 15:30 Elizabeth Barraclough
15:30 – 16:00 Brian Randell
16:00 – 16:15 Jason Bain
16:15 – 17:00 Unveiling ceremony & reception

This celebration is planned for the afternoon of Thursday 13th June, in the Event Space and the Atrium of the Urban Sciences Building, Newcastle Helix. During that morning the Newcastle University IT Service will have a small ceremony marking the University Council's decision that their new building is to be named "The Elizabeth Barraclough Building".

Background

The Flowers Report, and computing in the North East
The acquisition in 1967 of the IBM System/360-67 was a consequence of a groundbreaking Government initiative to improve the computing provisions at a number of British universities. This had been prompted by the 1966 Flowers Committee Report on the computer requirements of Universities and Research Councils.

Alone among these universities, Newcastle and Durham decided to join together and pool their financial resources, and to insist on the importance of interactive services and multi-user timesharing as an effective way of serving a large, disparate user population.

Despite the Government's policy of favouring UK computer manufacturers, Newcastle and Durham succeeded in obtaining permission to acquire a computer from IBM, which had become the globally dominant computer company. Furthermore, they were allowed to order a very special computer, the System/360 Model 67. In fact, when installed at Newcastle, the System/360-67 was the largest IBM computer in any British university, and was used to provide one of Europe's first time-sharing services.

What was System/360?
IBM's System/360 computer series, introduced in 1964, was revolutionary in its scope and extent, and was greeted rapturously by computing experts. But like the entire computer industry at the time, it was intended for conventional "batch processing": jobs were submitted by users to a queue, the results to be collected later. This suited the established business market very well, and for their new range of System/360 mainframe computers IBM provided the very successful OS/360 operating system.

What was the System/360-67?
However, interest was starting to arise, especially in some leading American and British universities, in the possibility of providing interactive computing facilities to their user populations which, typically, were made up of many very different types of users, each with different aspirations.

The University of Michigan persuaded IBM – with difficulty – to produce a modified version of the largest S/360-65, the S/360-67, which incorporated special features (in essence: "Virtual Memory") aimed at facilitating timesharing, based on work at Michigan by Professors Bernie Galler and Bruce Arden and their colleagues, and on earlier developments at MIT.
IBM built comparatively few Model 67s, but such was the success of the new architecture that from their next computer series (System 370) onwards, they incorporated and developed the ideas introduced in the Model 67. Where IBM led, the general computer industry followed! Indeed, these developments from over fifty years ago are one of the main technical origins of the present-day cloud computing world.

The Roger Broughton Collection
Thanks to the efforts of the late Roger Broughton in creating and curating Newcastle's extensive Collection of Historic Computer Artefacts some of the most significant components of Newcastle's System/360-67 have been preserved. These include the very impressive operators' console, and the display panel from the DAT (Dynamic Address Translation) Box; it was the "DAT Box" which enabled the magic of virtual memory.

These will be displayed together with other significant artefacts alongside a 3D-printed model of the entire System/360-67 computer room, which has been created here in the USB by the School of Computing's Open Lab Research Group.

MTS – The Michigan Terminal System
The provision of an effective time-sharing service depended on software as well as hardware. IBM began to create an interactive time-shared operating system (TSS/360) to take advantage of the System/360-67's abilities. But meanwhile Michigan – instrumental in the creation of this machine – were developing their own time-shared operating system, the Michigan Terminal System (MTS).

TSS/360 was found not to be working satisfactorily, so in 1968 Newcastle and Durham took the technically and politically brave decision to switch to MTS, rather than fall back to the use of the non-interactive batch system, OS/360.

By 1969 MTS had become one of the most successful time-sharing operating systems available. It was adopted by a consortium of eight universities in the United States, Canada, and the UK, and used, under constant development, for 33 years (1967 to 1999)!

MTS was popular with its users for its simple, powerful command language, and with the institutions for its reliability, and for the intimate connections that their own programmers had with the system itself. The bonds of friendship and mutual respect forged between the staff at the eight universities remain to this day.

IBM later produced the very successful VM/370 operating system in order to take full advantage of virtual memory facilities. At Newcastle, however, MTS continued as the basis of university computing on a succession of very large central computers right up until 1992. Usage of monolithic mainframes was by then being phased out in favour of smaller, dedicated Unix "minicomputers", and personal workstations.

And 1992 was the year in which Newcastle's Computing Service rolled out its first "Open Cluster" of 30 uniform PCs. To quote from a 1997 publication announcing the refurbishment of a Cluster Room:

> **"In 1992, we retired our last mainframe computer, an Amdahl 5860 with 48MB of main memory. The machines installed in this room today have a combined total of approximately 3,500MB of memory and offer about 500 times the computing power of that machine".**