

Through the 1950s, many major features were pioneered in the field of operating systems, including [batch processing](#), input/output [interrupt](#), [buffering](#), [multitasking](#), [spooling](#), [runtime libraries](#), [link-loading](#), and programs for [sorting records](#) in files. These features were included or not included in application software at the option of application programmers, rather than in a separate operating system used by all applications. In 1959, the [SHARE Operating System](#) was released as an integrated utility for the [IBM 704](#), and later in the [709](#) and [7090](#) mainframes, although it was quickly supplanted by [IBSYS/IBJOB](#) on the [709](#), [7090](#) and [7094](#).

During the 1960s, IBM's [OS/360](#) introduced the concept of a single OS spanning an entire product line, which was crucial for the success of the System/360 machines. IBM's current mainframe operating systems are [distant descendants](#) of this original system and applications written for OS/360 can still be run on modern machines.<sup>[[citation needed](#)]</sup>

[OS/360](#) also pioneered the concept that the operating system keeps track of all of the system resources that are used, including program and data space allocation in main memory and file space in secondary storage, and [file locking](#) during update. When the process is terminated for any reason, all of these resources are re-claimed by the operating system.

The alternative [CP-67](#) system for the [S/360-67](#) started a whole line of IBM operating systems focused on the concept of [virtual machines](#). Other operating systems used on IBM S/360 series mainframes included systems developed by IBM: [COS/360](#) (Compatibility Operating System), [DOS/360](#) (Disk Operating System), [TSS/360](#) (Time Sharing System), [TOS/360](#) (Tape Operating System), [BOS/360](#) (Basic Operating System), and [ACP](#) (Airline Control Program), as well as a few non-IBM systems: [MTS](#) (Michigan Terminal System), [MUSIC](#) (Multi-User System for Interactive Computing), and [ORVYL](#) (Stanford Timesharing System).

[Control Data Corporation](#) developed the [SCOPE](#) operating system in the 1960s, for [batch processing](#). In cooperation with the University of Minnesota, the [Kronos](#) and later the [NOS](#) operating systems were developed during the 1970s, which supported simultaneous batch and timesharing use. Like many commercial timesharing systems, its interface was an extension of the Dartmouth BASIC operating systems, one of the pioneering efforts in timesharing and programming languages. In the late 1970s, Control Data and the University of Illinois developed the [PLATO](#) operating system, which used plasma panel displays and long-distance time sharing networks. Plato was remarkably innovative for its time, featuring real-time chat, and multi-user graphical games.

In 1961, [Burroughs Corporation](#) introduced the [B5000](#) with the [MCP](#), ([Master Control Program](#)) operating system. The [B5000](#) was a [stack machine](#) designed to exclusively support high-level languages with no machine language or assembler, and indeed the [MCP](#) was the first OS to be written exclusively in a high-level language – [ESPOL](#), a dialect of [ALGOL](#). [MCP](#) also introduced many other ground-breaking innovations, such as being the first commercial implementation of [virtual memory](#). During development of the [AS400](#), [IBM](#) made an approach to Burroughs to licence [MCP](#) to run on the AS400 hardware. This proposal was declined by Burroughs management to protect its existing hardware production. [MCP](#) is still in use today in the [Unisys ClearPath/MCP](#) line of

computers.

UNIVAC, the first commercial computer manufacturer, produced a series of EXEC operating systems. Like all early main-frame systems, this batch-oriented system managed magnetic drums, disks, card readers and line printers. In the 1970s, UNIVAC produced the Real-Time Basic (RTB) system to support large-scale time sharing, also patterned after the Dartmouth BC system.

General Electric and MIT developed General Electric Comprehensive Operating Supervisor (GECOS), which introduced the concept of ringed security privilege levels. After acquisition by Honeywell it was renamed [General Comprehensive Operating System](#) (GCOS).

Digital Equipment Corporation developed many operating systems for its various computer lines, including [TOPS-10](#) and [TOPS-20](#) time sharing systems for the 36-bit PDP-10 class systems. Before the widespread use of UNIX, TOPS-10 was a particularly popular system in universities, and in the early [ARPANET](#) community.

From the late 1960s through the late 1970s, several hardware capabilities evolved that allowed similar or ported software to run on more than one system. Early systems had utilized microprogramming to implement features on their systems in order to permit different underlying [computer architectures](#) to appear to be the same as others in a series. In fact, most 360s after the 360/40 (except the 360/165 and 360/168) were microprogrammed implementations.

The enormous investment in software for these systems made since the 1960s caused most of the original computer manufacturers to continue to develop compatible operating systems along with the hardware. Notable supported mainframe operating systems include: