The Lockheed Electronics Company MAC-16

In 1969, Lockheed Electronics Company, a division of the then Lockheed Corporation, developed a "mini computer," the MAC-16 (also referred to as the LEC-16). It was a general-purpose computer that saw many applications in process control and elsewhere. Many of the early ATM machines were powered by a MAC-16. Successors included the MAC Jr., Sue, and System III, but the company dropped support for it in the late 1970's.

Capabilities

An early advertizing slogan was "In by 12:34:45.000000, out by 12:34:45.000002". This reflected a unique design feature whereby the processor with a 1 µs clock was able to switch processing contexts in 2 clock cycles. With a 16 bit address register, the MAC-16 could support only 64K words (16 bits) of memory, but most configurations were much smaller. 8K words were sufficient to support a FORTRAN compiler. Memory was expensive – hand-wired magnetic core memory costing around $1 per word, $4,000 for a 4K memory board, plus the cost of wiring a new backplane slot since this was before plug-and-play.

Use in Air Traffic Control

With such limited capabilities, could this thing be useful? With this processor, Lockheed won the original FAA competition to develop a prototype ARTS II – an air traffic management system for small, regional airports. Regrettably, they were underbid for the production contract by Burroughs. The Lockheed system was able to out-perform the Univac systems at Kennedy airport placing aircraft ID tags altitude values on the radar echo of each of 256 aircraft, and warning the controllers of potential collisions.

The following figures are rare pictures of a MAC-16 Air Traffic Control demonstration in Rome, Italy in December, 1972. Figure 1 shows the computer (center)with a "high-speed" (100 cps) paper tape reader, the ATC display unit made by Plessey (UK) Ltd and the single tape drive used for storing the program. The entire program was written in assembly language, and any software changes in the field had to be accomplished with memory patches using a primitive debugger on an ASR-33 teletype. Figure 2 shows the display with identity and altitude information tags on four aircraft in the terminal area at Fiumicino airport in Rome.

Figure 1 – MAC-16 demonstrating Air Traffic Control in Italy

Figure 2 – Air Traffic Control Display mixing raw and computer generated symbols