NSA USED UNIVAC COMPUTERS

Prologue and Editing by Lowell A. Benson

George Gray has extracted paragraphs from several now declassified documents at the George Washington University National Security Archive. George has given us permission to use his extracted materials – he identifies the source documents within the text below.

Previously, Mr. Gray had provided our web site with an 'Article for the Month' in 2007 - browse to section 2, #102 of http://vipclubmn.org/documents.html. George co-authored "*Unisys Computers: An Introductory History*" (UNISYS, 2008 – ISBN 9781615392230) with Ron Q. Smith. Ron had sent George's paper to me for IT Legacy web use.

I have formatted and done some punctuation editing. In addition, I have inserted comments using italicized parenthesis *{insertion}*. I have also '**bolded**' UNIVAC computer types.

UNITED STATES CRYPTOLOGIC HISTORY

Series VI The NSA Period 1952 => Present

Volume 5 American Cryptology during the Cold War, 1945-1989

Book II: Centralization Wins, 1960-1972 - Thomas R. Johnson

CENTER FOR CRYPTOLOGIC HISTORY, NATIONAL SECURITY AGENCY, 1995

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The A8/A7 split was the genesis of a new organization, called the Current SIGINT Operations Center (CSOC). CSOC was formed by Walter Deeley, he wanted a new name for the tip-off reports, thus he came up with the name KLIEGLIGHT, which would be used into the 1990s. The computer Deeley selected was a Univac product, which was the best machine at the time for communications interface. The TIDE software system, which managed the KLIEGLIGHT database and routed reports throughout CSOC, was written for the Univac computer. A8 was established officially in June of 1967. [p. 350]

That same year [1963], NSA **purchased the Univac 490**, which had a capability of handling thirty remote stations simultaneously. The stations were equipped with both paper tape and Teletype Model 35 input devices. The software, called RYE, was developed at NSA and was ideal for handling simultaneous inputs from the remote stations. It was made to order for processing from communications terminals, and thus it fitted NSA's emerging needs for handling 'Tecsumized' inputs from field sites, as well as a variety of other small-job applications. [p. 368]

In the mid-1960s, K Group (the PROD organization responsible for interfacing NSA with the field sites) began working on a system for accepting manual Morse data directly onto a magnetic tape. After experimenting with several different computers, it settled on the Honeywell 316, which could accept data from 128 different sources simultaneously. (Thus, a field site would have to have more than 128 Morse positions before it required more than one 316.) Honeywell, which sold the 316 at a very competitive $12,500, agreed to loan one to NSA, and a test was run at Vint Hill *{Farms}* in Virginia. The test system worked, and the Agency, which called the new system IATS (Improved AG-22 Terminal System), got $10 million in 1968 to install *{the}* Honeywell *{units}* at all AG-22 field sites. The AG-22 positions were wired to the on-site Honeywell *{processors},* which packed the intercept files onto a magnetic tape. Periodically (usually every six hours) the tape was transmitted on a high-speed data link to NSA. [p. 369]

At this point NSA embarked on a major software development effort to handle the expected influx of lATS data. Cecil Phillips gave the job to John W. Saadi, who was a team chief ' in Philips's C Group. Saadi, writing in assembly language, created a series of processes resident on a **Univac 494**, which accepted the data from the communications system. **The 494** built batch files and passed them to the IBM 360 through a shared disk arrangement. This was a groundbreaking task because IBM machines were notoriously difficult to interface with the machines of any other company. [p. 370]

Digital computer-based collection systems eventually became the rule rather than the exception. Some, like the IRON HORSE system used in Vietnam (see p. 549), automated the collection of manual Morse signals. *{However,}* Morse transmissions had a huge variety of formats, and the length of the mark or space varied depending on the sending operator. Computer-based collection was far more adaptable to baud-based signals. An early success in this area was Flexscop, a digital collection system. [p. 371]

The on-site computer (a CP 818) demodulated the signal, and then scanned the plaintext transmissions for key words. The system would alarm on recognition of high-interest text, and the operators would react with special processing and forwarding routines. It replaced the "ancient" CXOF equipment, which had been the equipment of choice since the late 1940s. With its stable frequencies, plain text, and baud structure, was especially suitable to automation, and NSA collection and processing systems for that effort became among the most automated in the business. [p. 373] *{The Military nomenclature CP-818 is UNIVAC computer type 1224. See all comments in section 3.7 of http://vipclubmn.org/CP24bit.html. Section 3.7.8 is copied on page 5 as an example of a user's experiences. }*

Chapter 16 Cryptology and the Watergate era (A523696)

At the front end of the process was the communications complex. This complex consisted primarily of Univac and Honeywell products, which were especially adaptable to receiving streams of data typical of those originating from communications centers. (Honeywell, in fact provided the IATS computers at field sites.) IDDF, the main communications center, used Sigma computers which processed record traffic from the Criticomm system. On the operations side, the **complex of Univacs** and Honeywells sucked up the deluge of intercept files being forwarded from field sites via the IATS system. It entered NSA through the Daysend program, and from there it was sent to *{blacked out}* which split out the intercept files for various applications programs. [p. 152]

The next stop was Carillon, which was a complex of five IBM-370s strapped together. These fourth generation computers were the most advanced on the market, but IBM products were notoriously difficult to mate with those of other companies, and material from the D system had to be reformatted and spun off onto magnetic tapes, which were then hand-carried to the *{blacked out}* complex and processed in job batches according to their priority. Batch jobs tended to be run at night SO that the material would be ready for the analyst in the morning. *{blacked out}* ran the applications programs that were specific to each analytic organization. This was almost entirely a traffic analytic process. [p. 152]

The Rye complex began in the late 1960s supporting NSOC's predecessor. The Current SIGINT Operations Center (CSOC), which served as a timely operations center on the Soviet problem. Klieglights were the grist for the mill - short, highly formatted information fragments, which often became formal product reports. The technology had been put together by *{blacked out}* and a team of traffic analysts and computer systems people. Like his boss, Walter Deeley, *{blacked out}* was abrasive and iconoclastic. But, he got things done, and Deeley liked that. [p. 152]

The Rye complex ran several different Software systems, most important of which was called Tide, which processed incoming Klieglights. Rye became the central nervous system for NSOC. and it internetted over 100 Opscomm circuits. By this time the Opscomm traffic (primarily Klieglights) **flowed directly into two Univac 494s**, which distributed it via CRTs to analysts on the NSOC floor. But, by the mid-1970s Tide had become overburdened. The mammoth Soviet naval exercise Okean 1975 *{Russian word for ocean}* submerged Tide in 88,000 jobs per day, more than doubling the usual load. Two years later the overworked system crashed seven times in a single day. The end was near, and programmers and systems analysts hurried a new system, called Preface, into being. Preface **operated on a Univac 1100**. Although it began handling its first job in 1978, it took several years to move all the processing **off the 494s** and onto the new system. [p. 152]

Cryptanalytic processing was still the biggest computer processing effort. NSA had four large complexes, each tailored to specific jobs. In addition, cryptanalysis was still the home of the special-purpose device (SPD), computers designed and built for a specific task. They were faster than anything else around, but were so job-specific that they usually could not be converted to another use, and when the target cryptanalytic system disappeared or became less interesting, the SPD had to be scrapped. By 1978, the main cryptanalytic complex had become known as Hypercan (High Performance Cryptanalysis), with a multitude of sub-complexes with names like Sherman and Lodestar. In each case, the main processor was a CDC product. [p. 152-153]

Two other complexes made up the NSA computer mainframes. The ILC processor, **a pair of Univac 1108s**, scanned huge volumes of plaintext commercial traffic using word dictionaries to find specific activity that NSA was looking for. When investigative journalist, Thad Szulc, published his twisted expose "NSA: America's Five Billion Dollar Frankenstein" in 1973, this capability was the one that he focused on most directly. A second cluster, consisting of CDC products, processed ELINT. The CDC 6600, considered by many to be the first supercomputer, was built by the successor to ERA, which had done so much contracting in support of NSG in the days following World War II. [p. 153] *{this implies that CDC was a successor to ERA. CDC was a 'spin off' of UNIVAC that was the ERA successor.}*

Chapter 10 SIGINT in Crisis, 1967-1969

Deeley pushed it with a dedicated single mindedness. A Group **selected the Univac 494** as the mainframe because of its communications handling capabilities. Software to manage the KLIEGLIGHT system was called TIDE. The concept was in only a partial state of existence when NSOC was created, but it soon became the dominant concept within NSA. It made near real-time truly feasible. [p. 485]

IRON HORSE - In 1967, the SIGINT system improved the speed of its support to air operations by a quantum leap. The creaky manual system, HAMMOCK, was replaced by IRON HORSE, a flashy new automated system that could deliver information in seconds rather than minutes. Designed by NSA, IRONHORSE simply linked the electronic output of an AG-22 intercept position, through a computer, to a radarscope. Instead of using a plot-tell system for calling aircraft positions to the TACC or CRC, the computer would convert the grid plot to a geographical coordinate and display it on a radar scope. An Air Force Security Service analyst carefully selected the plots that were sent to 7th AF. Those that were passed went into the BUIC II air defense computer at TACCINS and were integrated with radar plots from the U.S. system. Plots from SIGINT that went to the CRC, Task Force 77, and the Marines had a unique signature that identified them as not derived from American radar. USAFSS put a team of SIGINT experts in the collocated TACC and called it the Support Coordination Advisory Team (SCAT) -in effect, a CSG to help 7th AF interpret the data.

SCAT integrated manual Morse data as well as VHF reflections from the ACRP, the Navy's EC-121, and a variety of other sensors. "IRONHORSE decreased throughput time from twelve to thirty minutes to anywhere from eight second~ to three minutes." It was state-of-the-art and about as fast as Morse tracking could be displayed.

Thanks to George Gray for providing this UNIVAC computer usage history. *LABenson*

Web site section copied hereunder to show what a reader submitted.

3.7.8 Comments from: Tom Van Keuren - Senior Principal Engineer Raytheon Company

April 1, 2013

My first story about the CP-818 computer system is: I was in the Air Force Security Service in the fall of 1968 when I got the opportunity to be trained on the CP-818 FLEXCOP Ironhorse system at the National Cryptologic School in Maryland. The first thing they did was test us on basic electronics, and after testing, they called me into an office and grilled me for a while, because I was the first person ever to get a perfect score. Therefore, instead of the basics class, I got to play with a trainer computer, which I believe was the Univac CP-788 Universal Digital Trainer, because I remember its 15 bits word size. That extended until Christmas that year. Previously at the U of Minnesota I had heard a computer playing a simple tune, so I just had to program the trainer to do that. I got it to play Christmas music down the hallway by connecting an amp and speaker to a register LSB. Unfortunately, its slow instruction cycles limited its tonal scale accuracy to barely an octave.

The CP-818 computer at 24 bits and instructions as fast as 4 usec, plus shift instruction increments of 2/3 usec, meant far more accurate tonal scale accuracy for my later music program. In fact, it could provide 5.3 octaves range with accuracy within 1% at the highest note (even-tempered musical scale notes are about 5.9% apart).