**AUTODINER Stories (Part 4)**

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**A Data Communication Historical Series**

**AUTODIN (Automatic Digital Network)
by Jared Hall**

The AUTODIN was originally developed in the mid-1960s and provided Message Switching functions for US military. AUTODIN handled military record communications and communications support for special intelligence communities. AUTODIN outlived it's expected service life and was ultimately replaced with the MilNet Packet Switching network (The "original" components of the Internet) through the early 1990's.

AUTODIN was an interesting network. Most end-users interconnected to the AUTODIN through Digital Subscriber Terminal Equipment (DSTE) terminals. These used a modified version of the synchronous, byte-oriented, IBM Bisync protocol. Subscribers could also interconnect via asynchronous terminals, the most popular being the good ole' "Mode 5" teletype terminal.

Although only a teletype, these systems could also employ circuit-switching techniques, establishing a direct link to the receiving device (ex. Telex). AUTODIN was maintained by the US military and Western Union in the United States and maintained by Ford Aerospace and the US military overseas. At the time, overall responsibility for AUTODIN lay with the Department Of Defense's Defense Communications Agency (DCA).

How It Worked

Generally, if one had a data communications requirement, they would approach their local planning department or projects office (XO). After all of the justifications, resource identification, etc., the project is finally funded and orders are placed for equipment and interconnecting circuits. Equipment orders went up the standard procurement chain. In the US, a special group called DECCO (Defense Commercial Communications Office) in Ft. Huachuca, AZ managed all the AUTODIN interconnect circuits.

Eventually, you'd get a call that a crew would be out at some scheduled time to install the equipment. These would normally be special install crews from the appropriate military branch. The AUTODIN switches would be programmed and Western Union would coordinate the installation of the line with the AUTODIN switch Technical Control personnel. Most installations were connected to the nearest AUTODIN switching center, in the interest of reducing costs.

Using AUTODIN was pretty simple. Whether you're using a teletype or a glass tube connected to a synchronous circuit using ASCII, the process is identical. First, you bang out some header information. This includes things like; (1) who you want to send to, (2) who you are, (3) a priority statement, (4) maybe a security classification, (5) and a subject line. Now, you type out your message. Then, you run your tape through a tape reader or hit the enter key on your glass tube. That's all there was to it In some cases, you could even type out your message on a standard piece of paper and run it through an OCR.

The AUTODIN switch accepts your message and sanity checks it. If it all looks OK, it is then placed in a buffer where it is sorted and queued up for transmission over a trunk circuit to the recipient's serving AUTODIN switch. Many operations only had daytime hours, and thus provisions were made to store their data outside their normal business hours.

The serving AUTODIN switch accepts the relayed message, and sends it to the proper circuit. At the recipient's location, the message is usually printed out by a Computer Operator and deposited in a mailbox. Alternatively, it might be displayed on your glass tube or your local printer.

AUTODIN Site Personnel

Most US AUTODIN switches only had manning requirements of about 60 military personnel. There would be about 10 Front Office personnel, maybe 15 Technical Controllers, 10 Crypto technicians, and 20 Computer Operators. Western Union probably had about 30 people at each site; including shift-working technicians, a site chief, and some administrative and Engineering staff.

All sites had some type of backup power available to them. Immediate power load could be assumed by large MGs (Motor Generators), while backup diesel generators were cranked up. This would be tested periodically just to make sure that the bleary-eyed military Power techs could bring up the generators before the MGs ran out of juice. The Power guys rarely would (or could) enter the building, so you never saw 'em.

Front-office personnel always consisted of at least two military officers: the site chief, and the Special Security Officer. Technical Control usually had three NCOs in the office, overseeing Management, Training, and Circuit Actions duties. Operations had a similar complement of front-office people. Things were normally laid-back. AUTODIN sites were inherently isolated from most other base functions because of the security constraints.

Every once in a while, we'd get one of these "gung-ho" First Lieutenants on-board. What happens when a light-weight, high-velocity mass (Lieutenant) meets an object of enormous mass and little speed (Western Union)? The light-weight mass loses velocity. So to its credit, Western Union was able induce rapid attitude change in these individuals.

The Crypto techs had their own special room in the AUTODIN facilities. The Tech Controllers and Western Union would normally use an intercom to communicate with the Crypto people. The crypto vault at Gentilly came equipped with a futon and an alarm clock. Every once in a while, a Controller would have to go back there and wake up a sleeping tech.

Operations had the largest amount of space. They oversaw most of the computer activities that went on and coordinated frequently with Western Union. They also handled most of the incoming calls from the end-users. The Console Operators would check all the computer stuff out. If it checked out OK, they would use an intercom to have a Tech Controller look at the problem. If problems were related to local computer systems, Operations would normally use an intercom to contact Western Union directly.

The Tech Controllers and Western Union shift workers shared the same area. Generally, calls would come in via intercom from Operations. They normally provided a "Jack Number", which made it easy for the Tech Controllers to "punch up a circuit" on an oscilloscope. However, the Tech Controllers also got calls directly from other Tech Control facilities, Western Union, and from Job Control or Operations centers at the larger military bases.

Life in Technical Control

The Technical Controllers were responsible pin-pointing defective equipment in a circuit path. As calls would come in, the first order of business was to properly translate internal "jack numbers" with Circuit IDs. Of course, there were always errors. I also observed that Western Union also had the same chaos - just more organized and structured!

When calls came in, the first order of business was to look at the "red" (clear-text) side of the circuit. Most problems just required a resynchronization of the crypto equipment, especially those old, or "cheapo" customers that couldn't install automatic resync gear. Line-related problems could be diagnosed by looking at the "black" (encrypted) side of the circuit. Of course, there were patch panels that facilitated loop-backs and external test sets.

In most cases, line problems were simply turned over to Western Union for resolution. In the event of trunk circuit failures (circuits that interconnected the AUTODIN switches), the Technical Control facilities had special 4-wire AUTOVON dial-up circuits through which to restore communications. Use and testing of these facilities occurred between the Technical Controllers and AT&T. AT&T had much more automated test equipment than we did. During quality control checks, they would sometimes get frustrated while waiting for us to swap in and configure test equipment manually. If the backup circuits were flaky, AT&T was really good about tracing the calls and rerouting calls over better paths.

Working With Western Union

I truly enjoyed working with the Western Union technicians. They ran the full gamut - from the slim, techno-whizzes to the butt set-carrying/crack-showing, cigar-chewing, pant-splitters. There was even one crazy engineer who could tell 20 mA current loop circuits from 60 mA current loop circuits by sensing the current flow through his body. (Don't try this at home...volts do factor into the equation)! Still, for ambitious Technical Controllers, Western Union offered plenty of raw data-communications experience from which to learn.

Western Union taught me to respect other people's information. How easy it is to forget that any error can ruin someone else's day. In today's world, its far to easy for a System Administrator to blow away errant-files, without even thinking about ownership or the impact to some unsuspecting individual in the network.

Western Union taught me to respect other Tech Controllers time by checking out everything in-house first. This is a lesson that I still have to relearn from time to time.

Western Union also showed me that no matter how much technology is put into a process, things can still go awry. One case in point: high-tech Western Union microwave versus Mother Nature's temperature inversions.

AUTODIN 2

A newer system was planned to replace AUTODIN. Called AUTODIN 2, this network was packet-based, with trunk circuits employing ADCCP (Advanced Data Communications Control Protocol) at Layer 2. Testing of the new network was started in 1981 at a few of the US AUTODIN Switching Centers. Unique to the network was a cluster of 3 PDP-11/70s that did most of the central processing. Two of the three PDP-11/70s were always online, while the third PDP-11/70 functioned as a "hot standby". The PDP-11/70s operated over Ethernet, a "new" technology at the time. Training was supplied by Xerox PARC.

In the end, an Ethernet failure caused by a defective coax cable halted any further testing or deployment plans for AUTODIN 2. ADCCP went by the wayside, yielding to the ITU's LAP-B (Link Access Procedure - Balanced). The PDP-11/70s were shuffled around the AUTODIN Switching Centers and redeployed to support Automated Patch and Test Facilities.

AUTODIN has been replaced by the Defense Management System (DMS) and became operational on Sept 15, 2000 thus becoming the military's official system for passing all general service messages classified at the top-secret level and below.  It also modernized command and control messaging capability by allowing for multimedia attachments. DMS was implemented on more than 360,000 desktop computers at more than 7,000 sites worldwide in 2000.

**Memories of an Octogenarian --- The AUTODIN Days**

**By Joseph Klein, Sr. Engineering Specialist (Ret)**

 So there I was at the computer, one evening in April of 2015, browsing through the day’s email, when I read a note from a past Western Union (WU) employee and old friend (Ron Smith) , informing me that Jeff Lord, a mutual friend and WU retiree had passed away. He had read of Jeff’s passing in a publication of the Retirees of Western Union. That news, both of Jeff Lord and that WU had a retiree association brought back a flood of memories from my WU AUTODIN days and I determined to do some digging; first, to join the association and receive the publication, and then to see what might be archived or talked about by those who may have been “AUTODINNERS” from the early days.

 Why this interest in WU and AUTODIN? Well, I’ll tell you, and hopefully my memories will add a useful and interesting piece to the fabric of one of the most interesting programs in which I had the good fortune to participate.

 My career began with Radio Corporation of America (RCA). Following a few years in the early days of video development and RCA’s brave efforts to compete with IBM in the computer business, RCA and WU embarked on the program to replace the Plan 55 switching centers with a state-of-the-art solid-state switching system to be known as AUTODIN (Automatic Digital Information Network). It was a bold and incredibly successful undertaking. And the “Octogenarian” was fortunate to be involved in the middle of it at the largest of the five initial switching centers; Tinker Air Force Base.

 In 1961, during the design and manufacturing of the AUTODIN system in Camden, New Jersey, I was the specialist on the Accumulation and Distribution Unit (ADU), which was the interface between the Central Data Processor (CDP) and the buffer units which connected the system to the outside world. Shipment time for the system was scheduled for mid-1962 and I was assigned to support the ADU installation and integration testing at the Tinker AFB switching center in Oklahoma. We had a team of some 10 people, including hardware, software, and logistics types.

 The WU Site Manager was William (Willie) West. There were some 10 site supervisors and 20 union technicians, and a secretary. I must say that this group had some of the finest people with whom I ever worked. The supervisors I recall included Jeff Lord, Phil Mascho, I C O’Grady, Bill Bishop, Roland Rentz, Jess Gordon, and a Bloomer. The techs included Ron Smith (my friend to this day), C R Sneed, Jack Klein, Gary Pickett, Tom Pace, John Thomas, George Clubine, and Steiner. (After 50 years it is hard to remember them all).

 The AUTODIN building at Tinker sat at the very NE corner of the base, just north of the mile-long aircraft manufacturing building. Adjacent to the AUTODIN center was our microwave tower. A portion of the building included a secure section where the crypto facility would be located.

 Integration testing went well with most of the glitches being due to software problems which the RCA programmers ultimately solved. The programming was done in octal (0 > 7). Looking at a printout boggled the eyesight and I was amazed that people would choose that way to make a living. Of course, the hardware in those days is now the stuff of museums. For example, the data memory in each ADU consisted of a total of 16K locations, made up of four rectangular (8x8x8 inch) modules, each having 4,096 locations. Not only that, but each bit (one/zero) consisted of a tiny magnetic ring whose state could be reversed by the direction of the current through the matrix. I could write a book on the hardware of those days!

 Toward the end of 1962 integration testing appeared it would be shortly completed per Western Union, RCA, and the customer’s requirements. I would then return to Camden. But projects for RCA appeared to be somewhat sparse and I could not get a positive answer as to what program I would be assigned. At this point the great white knight appeared in the form of one Mr. Bob Delozier, an official with Western Union, who proceeded to “make my day” by offering me a position as a site supervisor. The one provision was that I had to have a layoff in writing from RCA before they could make me an offer. It took about 10 milliseconds to answer in the affirmative; here was a sure job at a higher level and we liked Oklahoma. So, I requested the layoff, received it in the form of a telegram, and presented it to Mr. Delozier. In January of 1963 I had my fingerprints taken at the Midwest City Police Department across the street from the base and became an employee of Western Union.

 Fitting in with WU personnel was a non-issue since I had worked with them for at least seven months. The technicians were members of the Commercial Telegraphers Union (CTU) and one had to be careful to not do “work” that they should be doing. Otherwise, a technician could submit a grievance against the offender. Perhaps because of my previous relationship with those fellows, I never had a grievance filed against me, although there were many times that I would be using a scope or performing some other activity that qualified for such an act.

 Two of the technicians, in particular, became my close personal friends. One of them, Ron Smith, lives in the Austin, Texas area. Ron was a pilot and I recall one Sunday morning he took me flying in a light plane. We did some touch-and-go’s,” bombed” an empty barn, and had all kinds of fun. We still keep in regular touch. The other fellow was C R Sneed, who was a U S Marine veteran, with a wonderful wife, Dotty, and two boys, Ricky and Alvin. He taught me how to play golf on the stony Midwest City course. C R and Dotty were from Illinois and had great plans to build their dream house and retire back there. As it turned out, the house was built but C R contracted a virulent form of cancer and passed away before he could enjoy that house with his family. Dotty kept in touch with us for some years after I left the Company. Tragically, the younger son, Alvin, who was the buddy of my youngest son, passed away later, also of cancer.

 Back to the AUTODIN world; we had three work shifts 24/7. The techs chose their shifts by virtue of seniority, but we supervisors had to work out a system where we would work the three shifts, changing every so often, with most of the guys on day shift, less on swings, and a couple of us on mid shift. I hated the mid shift – one morning after work, while I was waiting for the traffic light to change so I could turn into SE 29th Street, I dozed off and bumped the car in front of me!

 I learned much about troubleshooting circuit problems which had little to do with the switching centers but rather the physical connections to terminals near and far; some located on the other side of the world. One of these international outages, in particular, stands out in my memory. A terminal somewhere in Japan complained that they had no connection to the system, that is, an open line somewhere. We began a series of what the technicians called “bust-backs”, in which you send messages out and back to yourself at increasing distances from the switching center. Well, we busted back across the U.S., across the Pacific, and all the way into a Japanese telephone company some six miles from the terminal. The problem ultimately proved to be a downed wire somewhere in those six miles but getting someone to speak in English over there took an extra hour!

 Socially, we had a nice relationship with our peers. Willy arranged for us to have privileges at the Officers Club on base and the ladies enjoyed some of the functions that the military wives arranged. We also had parties at one another’s homes. In particular, I recall one such gathering at my house. We had our own “happy hour” and spirits flowed freely. At some point, O’Grady noticed my son’s coronet (small trumpet) on a bureau. I C said that he could play that thing and before we could intervene, he took out his false teeth and started to toot a couple of tunes!

 Occasionally I was tasked to teach the equipment to military and civilian customer people. I was instructing during one fine morning when Willie came running in and told me that I had to hightail it out to the Norton AFB site to help troubleshoot an ADU/buffer problem. I asked him a few questions: (A). How about teaching the class? Oh, Jeff Lord would take it over. (B). How about airline tickets? He pulled them out of his pocket. (C). How about clothes and packing? We will stop at your house and you can get some stuff.  (D) My wife is not home and the kids are in school. Leave her a note. So, we did those things and on our way to the airport in his car he knew that I was slightly steamed. He reached under his seat, pulled out a bottle of booze and told me told have some – I would feel better! Damn, how could you be angry at Willie?

 This trip introduced me to helicopter transit. In those days there was helicopter service from Los Angeles(LAX) to San Bernardino. We left LAX at sundown for San Berdoo and it was certainly a novel experience – looking out the window and not having wings to interfere with the view! I looked at the passenger manual to see what would happen if the rotor quit rotating. Hmmmm, auto-rotate safely to earth…….

 Another off-site trip is worth the telling. I was ordered to Andrews AFB to help fix a similar problem. Somehow, I had a Sunday available and thought it would be great to see the Smithsonian air/space museum. But, how to get there and where to park? WU came to the rescue. They had a service truck standing idle, with tools in the back, which they offered for my use. Well, I drove to the museum, parked along the street and enjoyed the visit – no parking ticket. The law probably thought there was a service call being done on site. (I also had the opportunity to see a Plan 55 center still in operation. So that’s the sound of about a million relays in action)!

 Those who are members of the Masonic fraternity will enjoy the following story: From time to time I overheard a few of the WU people talking about going downtown to see the Shriners parade and other referrals to Masonry. It made an impression on me because my father-in-law was a Mason in Chicago. Well, I asked Jeff Lord about it. He was delighted (it seemed) to recommend me to join. Another of the Masons was Jack Klein. There was a lodge where I lived (Del City Lodge #436) and by September of 1964 I was raised a Master Mason --- a happening of which I will be grateful for the rest of my life. In 1999-2000 I served as Worshipful Master of Tabernacle Lodge in Fort Worth.

 Well, as much as we enjoyed the work and living in that nice house on Woodview Drive (next door to Mickey Mantle’s sister), time for further education and with three growing boys was woefully lacking when one had to contend with intermittently working in the second and third shifts. At that time I subscribed to a publication called Electronic News. One day as I scanned the job opportunities, I noticed that General Dynamics Electronics Division in Rochester, New York had been awarded a contract to build more than 1,000 DSTE units to expand the AUTODIN system. This was an opportunity I had been looking for and I contacted GD/E regarding the position. I received a favorable response in August of 1965 and interviewed at their plant. An offer was forthcoming and we moved to Rochester in September 0f 1965.

 The rest is history; I never worked on DSTE because the program was delayed. Instead, I was assigned to work a telephone system for one of the Apollo tracking ships and then was transferred to Fort Worth in 1967 to work on the F-111 test equipment. Years passed; I worked the F-16 avionics and other programs and have remained in Fort Worth for some 47 years., having retired in 1995.

 Before closing, there is one more anecdote to recount that connects directly to AUTODIN. My youngest son joined the Air Force in the mid 1970s. After basic training he was sent to Wichita Falls for his job training. We went to visit him and were shown his training material which, surprise, surprise, I noted as AUTODIN - related! Upon his hearing some of my comments, he asked how I knew about that stuff. Well, he finally found out what I had been doing in the years he was 5-8 years old! Most of his USAF duties in AUTODIN were spent at Zweibrucken AB in Germany as shift leader.

 This concludes what this octogenarian recalls of the AUTODIN experience. I hope it has been of some interest. I have had great pleasure in the recollections and the writing of this story, especially because of the memories of the wonderful people with whom I worked and laughed. God bless you all.