

# Univac's London Development Center

*A Brief History by Arlyn Solberg*

Revised April 2020: Sadly, Arlyn passed away June 7<sup>th</sup>, 2015 – see page 4 of  
<http://vipclubmn.org/Newsletters/Enews1507.pdf>.

I, Lowell Benson, as the Club's Legacy editor have revised this article based on an email received from Jacques Lignieres 3/20/2020. His micro-bio has the 'credentials' for us to accept his change suggestions, bolded and inserted hereunder and on page 7 in bold text:

**I'm Jacques Lignieres, 77-yrs old, retired since 2004. I was with Air France between 1969 and 1988. I was responsible for the Operating System (OS) on the Univac 1108. My team and I built an in-house OS named TOP between 1971-1972 in order to be able to handle the traffic of the reservation system. This OS has been ported over 12 generations of Unisys computers and had been recently discontinued after more than 47 years of service. Over this time, we were quite often the first user of some Unisys hardware such as the lockbox (Big Mipper), or cache disks and sometimes we also connected some IBM equipment.**

**In 1987-88, as part of the team that designed Amadeus (which is now the number one Global Distribution System in the world), I was the chief architect. Moreover, in 1988, I was able to convince the Amadeus board to use the Air France fare-quote system running on Unisys Big Mipper with TOP versus an IBM proposed system. Thanks to me, Unisys has enjoyed one of its biggest system configurations between 1990 and 2006 in Erding (Germany).**

**After 7 years in a bank (1988-1995), I've been back to Amadeus where I finished my career in '04 as Senior Vice President for Development; responsible for more than 2000 engineers located in France, Germany, US and Australia.**

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<sup>1</sup> Click on a section title for a quick scroll thereto.

## Introduction

This chronology of the London Research and Development Center captures more of Unisys' history for our IT Legacy anthology being collected in part on the VIP Club website [ref: <http://vipclubmn.org/OurStories.html>.] A number of contributors have written histories of people, products, and projects which are being collected about various programs over the UNISYS and Minnesota predecessors' long [as computer companies go] history. I am writing this with inputs from several of the ex-London staff who were there in the beginning or during the growth of that Center. I was there for both the birth and death of the research and development center although it later continued as a European support center. We were Univac back then. From 1969 to 1974 the staff grew to over 200; too numerous to mention all their names herein.

### Concept of a Research Center-1969

In early 1968 I moved from NASA MSC in Houston to Helsinki to be project Manager at Kesko – the then largest wholesale company in Scandinavia. Kesko had an ancient ICL computer system and had taken delivery of a Univac 494 on-line transaction system to control their vast business network. Ed Mack and Brian O'Heron from the Northern European Group (NEG) in London were instrumental in starting a new real time systems group. My one year assignment in Finland ended and I joined them in London during February, 1969.

The basic charter of the group was to develop management and technical skills and transaction processing software for higher volume real time projects. There had been a number of painful projects over the previous years including the Scandinavian Airlines Systems (SAS) and United which, in part, led to the startup of the group with Ed and Brian leading the effort. The premise behind the funding for the startup was that commercial real time transaction systems would be a significant factor in the future and that the center of expertise in Univac real time was in London. The original members were Doug Thomson, Jack Myrick, Al Rachlin, Ron Knief, Stu Miller, Ken Smith, Fred Ruffel and a few others. We also had some of the staff from the British European Airway's (BEA) project.

### The International Research and Development Center

The International Research and Development Center (IRDC) name was chosen to differentiate us from other Univac development centers; emphasizing the 'research' aspect. We began work at the NEG headquarters in Mobil House on Victoria Street, near Buckingham Palace and New Scotland Yard. Space ran out at Mobil House and we moved a small group of people over to an old building on Old Brompton Road near the West London Air Terminal which was the BEA 494 computer facility. As we added staff, we again moved to a temporary site at Stonebridge Park near Wembley stadium. We were hiring new staff; both experienced people from the USA and Europe and recent British college grads, and needed a permanent computer facility. We finally found space near Paddington Station suited for a computer center [ceilings high enough for the false floor, etc.]. It was located on Westbourne Terrace down the street from Paddington Station. Paddington was the tube stop of choice for many of the people working at IRDC and some of them would travel an hour and a half. Travel time was partly due to the affordability of flats and detached houses with car ports and yards when you got that far out of London center.

### *Software Systems R & D*

The Real Time Operating System (RTOS) Functional Specifications used 494 STARS as the basis to evolve to the Univac 1108 and later the 1110 architecture. 'STARS' was based on the BEA airline reservation system; CONTORTS, which was developed at Eastern Airlines. To emphasize our new development, it was renamed STARS (Systems, Techniques and Realtime Software).

The computer center started with a 494 system, FH-432 and FH-880 Drums, Fastrands, tapes, etc. An 1108 system was installed and later an 1110. The first floor was renovated for offices and the second floor for computer room, operators and engineers' offices. A European 1100 field support group reporting to Roseville was established along with a couple of marketing staff. Hiring started in earnest for both operations and programming staff. We went from maybe 30 people to 100+ within the next year. The new staff went through operations or programming training as needed.

We incorporated the experience from various airlines including BEA, SAS, UAL, etc. We knew RTOS couldn't be a batch operating system although batch would be handled at a low priority to transaction processing. Deadline batch would also be logged and raised in the priority queue to execute as needed. We devised a set of programming standards that allowed us to run the same source code on both the 494 and 1110 systems; one being a 30 bit word machine and the other a 36 bit word machine. All code released on one machine had to pass tests and be integrated on the other machine. This led to one set of documentation for both systems. What evolved was a skinny 'OS' that had to adhere to extremely short instruction path lengths and core resident applications required to execute a "Standard Airline Transaction" which we defined from the transaction mix of the BEA and Eastern Airlines Passenger Reservations Systems. This standard transaction was used from then on to continuously test the RTOS throughput as it evolved over the next couple of years. A file access from drum was about 790 instructions executed and a duplex write was a bit over 900. In daily throughput tests, RTOS ran 104 transactions per second (TPS); [we also benchmarked EXEC 8 at about 50 TPS.]

Design of the recovery and security of the systems was a mainstay for a real time, continuously operating system. Multiplexing files across different storage devices was a basic function of the system. Detection of a faulty system hardware component caused it to be marked down automatically [or by operator intervention] and the system would recover and continue to run. To enable a customer to model his specific transaction system we created a System Exerciser to test throughput and integrity of either the customer's actual transactions or a simulation of his transaction profile. Profiles could be executed controlling the mixture and rate of transactions and the duration of tests. A Message Generator was developed to insert transactions at the communications network level to emulate manual inputs from various terminal types and measure transaction response times.

The Program Library Control System was a repository of programs, test cases and documentation to automatically compile and test each new module of code before it was integrated into the running floor system. It had the capability to swap a new module in for a system test run, dropping automatically back to the old module if the system failed to pass all the tests run against it every day. Unit, function and throughput tests were run against each module produced and integrated and if there was any throughput degradation, the module was backed out and returned to the programmer for review/revision together with his team leader and other 'peers'. If a unit of code didn't have all the documentation and unit test cases, it wouldn't be allowed to be released into the system. It was an automated adherence to development standards that prevented any patches or rogue code to be inserted.

Ed suggested the concept of a 'data driven' function that we referred to as a "Post Office" - a true precursor of object-oriented programming - where the existence of certain values of certain data would initiate a specific application [as opposed to the other way round.] A basic design was done but it wasn't implemented in RTOS at that time. We needed a compiler that wasn't a proprietary language and that we could 'grow' it into a real time compiler for our systems. NELIAC stood for the Navy Electronics Laboratories International Algorithmic Compiler and we chose it for our use. It produced efficient object code for both machines and wasn't subject to any industry standards control like COBOL, FORTRAN, etc.

A growth path was needed for the 494 systems and we defined a multiprocessor solution referred to as MAPS ("Multi Associated Processor System"). The idea was to dedicate enough private memory to each CPU so that it acted independently and only used the common memory for transaction data that needed to be accessed by other CPUs. We designed a Memory Access Control Unit to allow common memory files/records to be 'locked'. In this way, 2x CPU transaction system actually enhanced their performance beyond 1 + 1 by improving transaction-level queuing times [reducing average existence times and allowing greater concurrencies.] We were pushing it as a 494-based system but it was never built.

About 1971, IRDC was given the worldwide maintenance and development responsibility for the 494 OMEGA operating system. OMEGA/TCS handled both real time and batch. The 494 transaction system had been evolved and tested at Scandinavian Airlines. Ed Watkins was appointed from St. Paul as the LDC Director. Programming groups included 1110 RTOS, 494 Omega, 1195 software and field support. Ed brought in a number of 494 programmers to jump start the newly formed 494 Omega European development and field support team. As a result of MAPS, we designed a hardware and software system that would execute both 494 and 1110 machine instructions in one machine; it was named the 1195. The hardware was designed and developed in Roseville and we had the vintage 494 OMEGA software staff to design the new Operating System which we called 1195 PROMEGA. It worked well and we sold a few; one to Iberia Airlines for their Airline class B maintenance overhauls; a system owned jointly by a consortium of Air France, SAS, Lufthansa and Iberia all of whom were 494 or 1100 Reservation system customers. Union Bank of Switzerland bought another.

Eventually, to take advantage of the superior multiprocessing features of the newest Univac the 1110, we had to branch off from a dual 494/1108 library of code in the hardware specific areas of RTOS. We were compiling code under EXEC 8 and running the code under 1110 RTOS. We added the needed Exec Requests compatible with EXEC 8 to be able to run the Assembler, Compilers and Collector under RTOS to make it a standalone system at field sites so the customer wouldn't need the expense of leasing EXEC 8/1100 OS as well as RTOS.

### ***Marketing and Customers***

We were the support center for 494 STARS customers and assisted in a limited level of marketing support over the years. IRDC supplied a small team to develop a 494 trading floor trade collection system for the American Stock Exchange in New York to develop specifications for the system. Our offices were in a separate building around the corner from the Amex trading floor. On one occasion we were invited in to view the trading floor on a day when there was a 'run' on a stock or group of stocks. It was pandemonium; the view of all the commotion of trading was amazing and amusing. We could see the World Trade Center twin towers under construction at the time. AMEX took delivery of a 494 system and in an effort to test inputting odd lot trades on the trading floor using on-line "mark-sense" readers. The floor traders would scribble trades on paper as opposed to the "hand signals" that one sees being used on the trading floor. The system worked well but it wasn't implemented because the Amex IT organization combined with the NY Stock Exchange IT organization to form SIAC - the Securities Industry Automation Corporation. SIAC had no interest in continuing the development of a system that wouldn't meet the needs of the NYSE exchange as well.

The presence of a development center in Europe was a good marketing tool to impress clients that Univac was an international corporation. Lufthansa Airlines was running on a STARS system and we sent four of the IRDC staff over to Frankfurt for a year of support in late 1971. A couple of them ended up staying in Germany and the others rotated back to the Center or other projects in the UK. Iberia was also running STARS and SAS and Air France were also Univac customers running on 1100's or 494 Omega. We briefed another potential customer called the Yugoslav Energy Ministry although they were a potential 1106 with Exec 8.

In 1970, several IRDC staff visited the U.S. in support of 494 installations at National Car Rental and in Atlanta for the Airline Marketing Group. We submitted a proposal to SITA to upgrade their Univac 418 III systems so they could grow the level of services supplied to the member airlines. SITA was founded by 11 airlines in order to bring about cost efficiencies by combining their communications networks across national borders. We lost the bid. Currently SITA provides its services to over 550 members and 2,700 customers worldwide; this amounts to over 90% of the world's airline business.

Another potential customer in Melbourne, Australia; Trans Australian Airways (TAA) was looking at a 494 system running STARS. I was elected to go down and lead the effort to write functional specs for their Passenger Reservations System based on STARS Functional Specifications. The team of joint Univac and TAA (now Australian Airlines) staff modified a generic Reservations System Functional Specs, making changes to tailor the system they needed. Based on this, they signed a final contract with Univac. The managing group in Sydney and the people back at IRDC were happy to add another major airline to the STARS set of clients. Later when TAA came up to London to see STARS in operation at IRDC they learned that they had to compile programs under 494 Omega to run under the STARS system. We had already decided that RTOS must be a standalone system [even though the IBM TPS/PARS system also compiled code under their standard operating system.]

The European marketing arms of Univac were divided into several groups run out of the London European Division office. The Southern European Group was based in Rome and included France, Spain, Africa and the Middle East. The Northern European Group included the British Isles, Scandinavia and Northern Europe. LDC gave them a number of technical presentations on RTOS but most of the marketers weren't aggressive enough to sell it into a customer base of Exec 8. We were now seen by many in the company, particularly the EXEC 8 group in Roseville, as being a competitor to our own product line. We were vying for product development money with Blue Bell and Roseville.

One primary justification for RTOS was that we could run 104 standard airline transactions per second to EXEC 8's 50<sup>+</sup>; double the throughput. Roseville management opined that they could grow Exec 8 to handle their transaction volumes eventually. When BEA was combined with BOAC, Univac submitted a proposal for their new Reservations system. IBM was the incumbent at BOAC and we did a comparison with IBM's TPS system running at BOAC. Their TPS 'file read' was about half the path length of our STARS/RTOS floor system. We lost that bid although politics also played a part in the vendor selection as usual. That was a huge loss of their airline business from 1970 on.

### ***Management Development***

An equal part of our research and development charter was to develop management skills necessary for project implementation. Every management level attended to an outside management course, starting at the Director and his Group Managers, then to Group and Team Leaders. We undertook to clearly define the responsibilities and authorities of each member; ensuring only one assigned primary responsibility and also secondary or signature responsibilities and authorities. The whole center now had a clearly defined set of responsibilities and authorities. Every employee had a position description which defined three month objectives. We had mandatory personnel reviews every three months to measure progress and development needs. This methodology eliminated contention between managers and their employees as measurable goals were either met or not.

Training included a mandatory rotation of all programming personnel from one position to another to promote software cross training in all areas of the system. Team members would rotate every nine months, team leaders [4 groups of 3 teams each] every 12 months and group managers every 15 months. Computer operators could rotate into programming. Programmers would typically rotate within the Communications, Languages or the PLCS Group and eventually into the Operating Systems Group.

Over the space of 4 years everyone would have worked in every area of the RTOS software. Our young staff had wider experience than staff in other centers where one may work for years in only one area of a software system. The four groups had three teams of six totaled about 19 staff. The average age of the total programming department of 80<sup>+</sup> staff was only about 24 years old.

Every Friday we held cross training lectures for all employees, including secretarial staff on technical and management subjects. Most of the presentations were by our staff. The engineers gave sessions on how peripherals interfaced with the CPU, priority of interrupts how the memory, I/O and arithmetic unit related to one another etc. A lecture and work session was presented on “sizing a system”. It included queuing theory and calculations on the of message input and its relation to the need for the amount of processing and channel throughput capacities required for various transaction throughput rates of a theoretical system. That was at the crux of a real time transaction system design. We held cross training at the Great Western Hotel in Paddington and also in an unused church down the street. It was old and cold but large enough to serve the purpose. During one session an inebriated local chap wandered in, sat in the back row and clapped every few minutes. Cross training was a success.

By 1974 IRDC consisted of about 180 including Programming, Systems, Operations and Engineers. There was also a European EXEC 8 support group who shared 1108/1110 test time in the computer center. We produced time statistics from our online data collection system; it being part of the ‘research’ in management technique and practice. Timecard statistics collection revealed that most staff only spent less than 75% of the time designing and programming; the rest, in keeping with the management development charter was cross-training, keeping abreast of development by other internal groups, meetings and other overhead items. That was acceptable. We probably had a dozen regular meetings every week designed to solve some problem or review status. We were all familiar with “Roberts Rules of Order” in preparing for and conducting meetings. LDC became a resource for the Sperry Univac European marketing organizations and User groups. They had come to recognize that we were doing a lot of project management theory and had written extensive technical papers, policies and procedures about project planning and management principles.

### ***European Considerations***

Having a development center in England brought some unique experiences that weren’t present in the USA. In 1971 there was a coal miner’s strike which had a real impact on London. Power plants would cut back on output and huge grids around London would be blacked out at various times of the day. We got permission to keep the computer center powered up but the office area lights and heat would be turned off at various times during the work day. The local law stated that if it cooled down to 55 deg., the staff could go home at their discretion. We bought gas lanterns for some of the managers’ offices. I lived on the 8<sup>th</sup> floor of a flat in Fulham so I would hang out in the local pub until the power came back on in my district and the lift was working. In another incident, a local newspaper reported that an agreement with Finland to produce paper pulp had ended. Overnight there was a run on toilet paper and local stores were cutting paper towel rolls in half to make up for it. A few days later, the Finns made it clear that there was no pulp shortage and everything went back to normal.

World events affected the group somewhat also. Nixon resigned and Ford took over in 1974. OPEC raised oil prices in 1975 causing a worldwide panic. Petrol prices went through the ceiling [for sale: used Cadillac--\$50; used Cadillac with a full tank--\$250.] Most of my staff didn’t drive to work as the tube train was easier and there was only limited parking space at the center. About 1973 there was a nationwide pay freeze which affected our ability to increase pay for the staff. I hired new college graduates for about £1650/year which was about \$3500/year at the time. My budget for pay increases was around 20%/year which wasn’t too bad. The law was that you could only give pay raises coupled with a promotion.

We finally decided to create new pay grades using all the even and odd numbers from grade 2 [programmer trainee] to 17 [Group Manager.] The standard Univac practice was to use odd numbered positions for software personnel and even numbered positions for hardware staff. In spite of this a number of people took jobs with ICL and other places just to get pay increases.

A word might be included here about how Europeans looked at on site partaking of the fruit of the vine during working hours differently than the USA. In France, you had wine with your late lunch. In Spain the everyday restaurants in Madrid would automatically place a liter of wine on the table to drink with the lunch meal. They would measure how much you drank and charged accordingly. The Univac Madrid office had a bar in the basement and would serve drinks there or at your desk if you called down to order. Most European countries workplace cafeterias would include wine and beer. Wartime drinking hours in England were still in effect then so the pubs would be open from 11 AM to 2:30 PM and then again from 5:30 PM to 11PM. Around the Westbourne Terrace office were a number of good lunch time pubs and restaurants within walking distance. The local work pub was the Prince of Wales (alias POW). It was approximately 43 steps from the office entrance and on the way to Paddington Station. It was hard to avoid the pub stop going home from work and a lot of dart throwing and work discussion went on there.

## The London Development Center

Since we were supporting the 494 systems worldwide and developing applications software in the form of Message Switching, management decided to rename the center the London Development Center (LDC) in keeping with the other Product Division centers in Blue Bell, Roseville, Salt Lake City, etc. Stan Erdreich came over from Blue Bell as the new Director to replace Ed Watkins who was returning to the USA. Shortly after, we reorganized to create a separate RTOS Field Support and marketing support group among other changes.

During this period Air France seemed to be a possibility as a customer for RTOS. They sent a team of about four over to London to study RTOS for a few months. They were running their TOPS which they had exported to and installed at Aeroflot in Russia on an 1106 system. They intended to move over to RTOS when we had made our first public release but that was never to be.

**The team of four was mainly Jacques plus sometimes with one of his engineers and sometimes with legal/contracts people. They never located people in London. The purpose was to check some basic design especially for files in order to be able to run our applications with RTOS without a cumbersome conversion. We had only fourteen one day meetings at Westbourne Terrace between October 1973 and May 1974 (10/03, 10/29, 11/30, 12/8, 12/11, 12/15, 12/29, 01/17, 01/31, 02/14, 02/28, 03/22, 04/04, 05/02).**

After studying RTOS, Air France implemented some of which they learned into their TOPS [which Unisys Airlines Ops tried to purchase/franchise years later (1988) to fill a Unisys need for a real time airlines transaction system.]

**Air France gave a copy of TOPS to Unisys {via Jacques} so that Unisys could fulfill an Amadeus contract, i.e. the fare system of Amadeus.**

RTOS and TOPS may also have been the architecture and technology fore-runner to the All Nippon Airways proprietary transaction system as they had an ‘unofficial’ copy of both.

Our first beta customer was the Spanish Telefonica (CTNE-Compania Telefonica National de Espana). Telefonica contracted for an 1110 RTOS system running a message switching application. LDC was developing a generic message switching application under the preview of the Airlines Development Center in Eagan, MN. It was eventually to be included as an application in the USAS airlines system suite of applications. The Message Switching project was behind schedule as testing deadlines for the application being done in LDC were missed. The project was placed on Univac's 'Critical Projects' list which made it visible to pertinent upper management. We got lots of unwanted help from Rome, London and the USA. The European Division was responsible for the project and we moved the LDC RTOS Exec and Message Switching personnel to Madrid to work at Telefonica's new computer center. The Univac on site task force consisted of about 54 people, mostly from LDC with seven local subsidiary staff on board. Garfield W., Univac's rotund and greatly skilled patriarch of troubled projects came to town as a direct emissary from Sperry President Probst. London field support headed up the software team and the Madrid office headed up the hardware side with 1110 hardware and CSP communications support from the USA.

On site testing proceeded in April with the task force running three shifts; the third shift being for tests only. A Telefonica team supported the online testing and reported back to their upper management. Toward the end they arranged for about 50 of their existing message switching staff from around Spain to enter teletype data to generate on line messages. In early August, the system was to be tested for 24 hours to pass acceptance. We ran for over 25 hours to pass and then let the system run for almost 60 hours without a single fault before a buffer overflow limit check failed; very resilient for a new software system. The system automatically rebooted as designed and continued running. The problem was fixed in a few minutes. However, after being on Univac's critical project list for the several months, upper management had made the decision to maintain only one 1100 Operating System and RTOS development was to be terminated.

## LDC Aftermath

As RTOS development was closed down; the remaining LDC technical staff was absorbed either into the European Division or offered positions in Roseville to work on a new system development starting in Univac's Product Division. It had been conceived in a meeting in Roanoke, VA and was referred to as the Roanoke Program. It was intended to bring the various hardware and software lines of Univac under one hardware and software architecture. As I recall, some 40 of the LDC software staff were transferred to Roseville to work on the Roanoke program. Some chose to go to Blue Bell as the program included staff from there also. A number of remaining LDC staff was also placed in the UK and Europe. The Roanoke program was disbanded after a couple of years and some of the LDC staff repatriated to England. Others stayed on and settled in Roseville and Blue Bell and by now many have retired from the computer world.

Several of the ex-members organize a reunion in London every five years, usually held at one of the pubs in the Paddington area. It is still being held and the last reunion was in 2009. Yes, we are all getting older, but it was gratifying to see and talk to all the members, their lives and successes since those days back at IRDC/LDC.

*Arlyn Solberg*

{Editor's Note: Mr. Solberg also contributed Legacy article #163 in February of 2012.  
<http://vipclubmn.org/Articles/TRANSIT.pdf>}