## INTRODUCTION

The slide-by-slide scripting below is associated with the webinar presentation for the U of MN CSE Software Engineering Twin Spin organization - February 1, 2024; arranged by Unisys' Jim Plasek.  The University also recorded a video of the presentation including their introduction and the ensuing Q & A session.  To a degree this is a recap of the ERA to Unisys history partially available in other publications and videos.  One new item herein, my claim that **ERA was the First Computer Company** has not been printed in the many publications nor unpublished papers that I've read this century.

Unfortunately, ~~Expletives Deleted~~, my first-time laptop use of the google slide app in conjunction with the U's zoom connection caused a couple of presentation inconsistencies.  The slides in the video have a slightly different sequence than listed here because of inadvertent scrolling forward and not knowing how to backup, i.e. Slides 3 and 4 were presented after slide 28 and I did not present Slide #9.

AND, my script was on an adjacent PC screen that wasn't connected to the laptop scrolling so most of the video talk was from my grey cells rather than this script.  Should have rehearsed a few times.

Mea Culpa!  *Lowell Benson*

## Contents

*Presentation prepared with Microsoft PowerPoint and Word.*

### Slide 1 – Unisys History

   Good evening: When Jim sent me an email asking for a Unisys history talk, I looked at the TwinSPIN web site.  I was happy to see the System Development Life Cycle chart with system phases – Careers of many people with whom I've worked spent time in each of these phases, some all phases of systems.

The Unisys name and corporation started in 1986 when Burroughs bought Sperry to form United Information Systems. The Unisys History includes predecessor companies; Sperry, Remington Rand, UNIVAC, and here in Minnesota, **E**ngineering **R**esearch **A**ssociates (ERA).

## Slide 2 – Presentation Topics

Where to start was an enigma so I juggled the slides from the published draft sequence!

Most people, when asked about computers in Minnesota, think first of Control Data Corporation or Cray Research or IBM in Rochester. I am assuming that all of you are familiar with the Bill Norris name – some people do not realize that Control Data was his second Minnesota Company. ERA was his first in MN and starts the lineage to today's Unisys.

First, Interactions with the U since this is a university presentation.

2nd corporate merging and diverging, computer systems' evolutions, talk about some defense systems on going yet today, note a local artifacts museum, and talk about a public recognition of ERA last year.

ERA was the world's first computer company, thus the father of **UNIVAC** and the grandfather of **Unisys**!

Finally, I will wrap up summarizing 'Telling the ERA to Unisys' story documented to date.

Part of the story is in this DeBrosse/Burke book –*Secret in Building 26, it* finishes with the founding of Engineering Research Associates (ERA) just after WWII. If you watch the movie, *The Imitation Game*, you will get a taste of the environment that Mr. Norris and others were in 80 years ago. In 1945, the Navy wanted to keep their code busting capability thus the stimulus to start ERA.

## Slide 3 – U of MN Interaction

Most of my slides are Wikipedia like in that they have links to references. For example, we had Dr. Kumar's permission to post CSE's *40 years of Excellence report* as our March 2009 article for the month.

Hundreds if not thousands of U of MN engineering graduates had their first employment at ERA/UNIVAC/Sperry/Unisys and/or the spinoff companies.

Some specifics, Read the slide bullets:

Talk a bit about the 2011 collage donation to CBI, this is a great artifact.

## Slide 4 – U of MN Telling the Story

Our Legacy committee started in October 2005, realizing that the few books touching on ERA and Univac only told bits and bytes of the full story.

So … READ THE SLIDE Bullets,

2008: Dr. Misa covered all Minnesota computer history in addition to ERA/UNIVC/Unisys. Control Data, Cray, Honeywell, IBM, … He also discusses 'The Gopher Way' – one of the internet predecessors.

### Slide 5 – Merging

The Unisys formation from 1946 to 1986 is the solid red line down the middle.  Predecessors are the sloped lighter red lines.  Technology companies have been creating and supporting businesses for many, many decades i. e. in 1873, Remington and Sons began. They merged with a typewriter company in 1912 and Rand Kardex in 1927 to become Remington Rand.

Rem Rand bought Eckert Mauchly Computer Corporation in 1950 and ERA in 1952.   EMCC had called their machine UNIVAC, an acronym meaning Universal Automatic Computers – the term UNIVAC was used synonymously with computer in public publications.
Middle downslope. Sperry gyroscope had started in 1910 then consumed Remington Rand in 1955 to form UNIVAC Division of Sperry Rand.
The right red downslope is American Arithmometer in 1886 taken over by Burroughs in 1905.  Burroughs bought Sperry in 1986 to form Unisys; **Un**ited **I**nformation **Sys**tems after an employee naming contest.
        A few loyalists would say in jest Unisys means – **UNIVAC** Is Still Your Supplier.

### Slide 6 – Diverging

   Company names kept changing as Corporations tried to prosper in changing business climates.  Our ERA lineage icon shows the name sequence in Minnesota.  When a co-worker, Paul Welshinger, retired he said that he'd kept every pay stub for 32 years of employment – same company but nine different names on the pay checks,
 Read the dates on the slide.
   In 1962 Remington Rand Univac (RRU) split their business accounting into profit centers, defense and commercial operations.  When Burroughs bought Sperry to form Unisys in 1986, the profit centers split continued.
They renamed the defense systems division to Paramax intending to spin it off via an Initial Public Offering (IPO).  Wall Street feedback was that at best they $5 would get per share versus the hoped for $20 per share.  The IPO plan was halted, and the name reverted to Unisys Defense systems.
https://vipclubmn.org/lmcolegacy.html#Names.

### Slide 7 – Facilities

The first ERA facility became the UNIVAC/Sperry/Unisys plant 2, pictured at the bottom of this slide.
   This is where the original ATLAS was shipped via train car in late October 1950.  An installation team went to Washington in November to unload and set it up.  They returned home for Thanksgiving and returned in December for acceptance testing.  The existence of this ATLAS computer wasn't publicly noted until 17 years later.
In 1952 ERA had four facilities when acquired by Remington Rand, three in St. Paul and an office in Washington DC.
   READ the plant locations.  In 1982 we had shuttle bus service between some of the buildings or a mileage chart to put in reimbursement claims if a personal auto had to be used.

**VIP CLUB**
Established in 1980        More plants were added as business grew – 28 in 1986 when

**Unisys** started,
The ARROW points at the Minneapolis Saint Paul airport control tower.  We had employees working there as a test site for the FAA's Air Traffic Control.

## Slide 8 – System/Computer Lineage

The ERA newsletter 'the Orbit' 1953 article shows the 1103 computer system which is shown in the photo, note that the system included tape units, a printer, a typewriter, and the computer console.  The Family Tree of systems' evolutions are noted by computer developments that implemented new technologies.

At the left of the chart are the EMCC/UNIVAC machines developed in Blue Bell, PA.  The UNIVAC II prototype was in the St. Paul ERA plant 2 for integration of a core memory function!

Down the middle, this genealogy chart shows 1101 (ATLAS) to the 1107.  Why 1101?  One one oh one is binary for 13, the number of the classified task that developed the ATLAS. After about ½ dozen 1103 systems had been delivered, the customers and UNIVAC formed a User Group to exchange scientific application techniques, etc.  The 1103A was also called the Univac Scientific because they added hardware floating point circuits.

Most of the machines and systems on this chart used vacuum tube electronics to implement the logic plus capacitors, resistors, and a few diodes.
The Athena, M-460, UNIVAC 490, 418, and 1107 had transistor electronics.

The black arrows 'UNIVAC file computer' and '418' and will be discussed later.
We have a listing of most of the customers of the systems on this page.

## Slide 9 – Human Computer Interfacing

Human-Computer Interface (HCI) devices occur with all systems:  The technology evolution just seemed to happen!

The ERA 1101 used paper tape as program and some data inputs.  The control console had bit indicators for all internal registers; Earl Josephs became a well-known futurist.

The second machine, Speed Tally, had a special desk input console for a mail-order house inventory tracking in Chicago in the 50s.  Then youthful Don Weidenbach is shown with a data entry lady.

Speed tally morphed into the file computer. About 200 of these were built, they had special data entry consoles.  Northwest Airlines and other airlines used special consoles to for call-in operators to manage airline reservations in their cities.  The FAA used these at enroute centers to record and manage flight plans for aircraft flights between cities.

The 1107 had a keyboard interacting with the computer's executive control software.

## Slide 10 – HCI – patents, CRTs adapted

A cathode ray tube (CRT) with keyboard was the next HCI step.  UNIVAC's Lee Granberg was granted a patent for character generation for tube displays among his dozen patents dealing

with display techniques.  The trackball under the operator's thumb was used to point to and select data relative to 'blips' on the screen.

Then in the same Shepard Road laboratory, UNIVAC's Charles Kiesling was granted a patent for cursor blinking in 1967, note the DOS floppy discs used by this UNIVAC suitcase computer.  The mouse and touch screen inventions for Graphic User Interfacing (GUI) came about later.

In 1978 in the Eagan facility basement, we did electronic voice word recognition and speech generation which led to a voice mail patent.  We demonstrated word spotting and sentence generation in English, German, and Russian.  With this technology we created an early computer voice response system (VRU) and the **V**oice **I**nformation **P**rocessing System. The Otto Versand company in Germany used VRUs for call in ordering of products. Eastern Airlines used VIPs for crew scheduling.  Both could handle up to 10 calls concurrently. Engineer Ray Hedin used an 8-bit 8080 chip per line.

 Today we have cell phones – we talk to them, and they talk back. YES, the groundwork for this technology came out of UNIVAC, before we were Sperry!

## Slide 11 – Systems/Computer Lineage

Unisys Fellow Richard Petschauer has published hardware technical details of these.

This partial delivery table shows about 5,000 1100 series commercial systems before the advent of the 2200 series.  Some of these were manufactured at a plant in Rödelheim Germany.

Another two decades of Family Tree computer systems.   At the left, are the Blue Bell systems.  At the center, the 1107 through the 1100/60 – circuitry from transistor electronics to application specific integrated circuits (ASIC).

At the right are a few Navy computers.  Of some significance on the genealogy adjacent to the 1108 is the Nike-X system - **ARROW** – designed and prototyped before SALT shut off deployment.  This provided the design concepts for multi-computers sharing memory banks, i. e. the 1108 commercial and the Navy AN/UYK-7.

If you happen to be on campus walking on the U's Scholars Walk – look at the etching on the side of the engineering building – you will see a logic diagram of the Nike-X from Rollie Arndt via CBI archives!
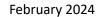
The mid-90s began a transition from custom designed computers to today's' embedded microprocessor systems – both commercial and defense.  Unisys servers now have Intel and Dell hardware managing their 'Cloud' systems and serving customers from several US sites.

## Slide 12 – MAPPER – since 1968

Lou Schlueter has a 50-slide MAPPER history detailed slideshow, Maintaining ……. I've extracted some information.
UNIVAC/Sperry/Unisys created a software package MAPPER and started using it internally for production control of the 418, 490 and 1100 series computers and peripherals.  The software and database system used the 418 small scale computers.

418 as a computer system type was because of a four-microsecond memory and an 18-bit word length.

Used in St. Paul …*read some of the functions* ..
Extended to other Sperry facilities  *read some of the places*…
This was quite successful – long before SQL was in our terminology.

### Slide 13 – MAPPER – Business Information System since 1986

After Burroughs and Sperry became Unisys, it was called Business Information Systems.
A customer saw the system being used in St. Paul and asked to have a version on their systems.  So, the support team created the MAPPER 1100 software system.
Illustrated at the right is the first non-Sperry user – Sante Fe Railway.
Over the years , MAPPER was 'ported' to evolving control software, ….
MAPPER software was used throughout the world.
MAPPER support teams created interfaces with other industry software.

### Slide 14 – MAPPER in the 90s

Customers using MAPPER were from many, many industries.
   *Read some of the customers.*
In the early 2000s, Lockheed Martin in Eagan was using MAPPER system as its payroll generation functions.  Next week when I board a Royal Caribbean Cruise ship, the ship's ID card will be linked to a UNISYS MAPPER system that records each cabin door use, on or off the ship, charges at the ship bars, …
There was a Unisys MAPPER Users group that shared methodologies, in 2008 they celebrated 40 years.

### Slide 15 – Naval Tactical Data Systems (NTDS)

During the Korean conflict (war) the Navy learned that their manual systems could not keep up with jet aircraft and missile attacks.  About 1953 they started writing specifications and planning for NTDS development.  Two of the spec writers were U of MN engineering graduates in the 30s! (McNally and Svendsen)
Read the bullets.   Hughes in CA was contracted to develop display units, Collins in Iowa was contracted to develop a digital radio communication system (LINK 11), and UNIVAC in St. Paul was contracted for computers, software, and system integration. Six prototypes were built in 1957/58, then seventeen service test units were delivered in '59 and '60 for testing at sea!
The Minneapolis Star had a 'high-level' article Sept. 27, 1960.  In the top left of the Star's illustration are friendly aircraft firing a missile at enemy aircraft top center.  Part of NTDS is **I**dentification **F**riend or **F**oe (IFF).  A shipboard 'pinging' radar causes transponders aboard friendly planes to send back the plane info.  Since the enemy aircraft did not have transponders, NTDS would know which is which.  A ruggedized 418 computer, type 1218 did the radar control and transponder processing.
Ships computers exchange aircraft and ship locations between each other and the on-land shelter-housed Marine Tactical Data Systems.

NTDS was subsequently integrated with NATO and SEATO military systems.  Capt. Boslaugh's book is a good read!  We have one chapter linked from our site.

## Slide 16 – NTDS Systems Technology Evolution

Models at the Lawshe Memorial Museum in South St. Paul are the USQ-17, CP-642A, CP-642B, CP-667, **CP-789 (type 1218)**, CP-808(USMC), CP-848 (type 1219), CP-855 (NASA), CP-890 (subs), and UYK-7.  These are 1" = 1' models.

About 450 USN ships, about 70 German Navy vessels, a few dozen Canadian Services ships, Australian Navy, Japanese, …, In the 70s I saw 642B computers in a French Navy lab and in a German Navy lab. In the 80s we did an UYK-7 enhancement study including modeling cache memory techniques by university professors, Dr. Pete Paton and Dr. Bill Franta.  These concepts from the U were used by Dave Kaminski in the UYK-43 design.

Bob Pagac is standing in from of a dual processor AN/UYK-43, same ISA as the UYK-7. Behind Bob's left elbow are two AN/UYK-44 processors and an AN/UYK-20 processor – 16-bit machines that gradually replaced the 18-bit Navy machines.

1994.  Unisys defense systems won the development contract to embedding Commercial Off The Shelf (COTS) processors into displays.  Design and prototyping in Eagan – then it became Lockheed Martin.  So, the production was in Clearwater FL where we had been building other Navy computers.

These display/processors have the nomenclature of AN/USQ-70.  Now on most Navy ships including the USS Minneapolis Submarine.

## Slide 17 – Air Traffic Control (ATC)

Why? As the Navy was developing NTDS, a congressional committee asked if the investments in technology could have civilian applications.  The **I**dentification **F**riend or **F**oe techniques and radar/screen use of characters was the result for airport and airways control.

The key is to have tracking radars and 'pinging' radars.  When in the area, pinging causes aircraft with transponders to send back their flight number, altitude, etc.  Processing equipment corelates with previously filed flight plans then puts the data on Air Traffic Controllers screens for monitoring.

Atlanta Georgia was the first development site with their multiple runway and high traffic.  Second was the New Your City area with multiple large airports. ARTS I used the same UNIVAC 1218 computer as the Navy did for IFF.

Then the FAA defined systems for their enroute centers, for their 100+ small airports, and their 64 large airports.  IBM won the competitive contract for 23 enroute centers, Systems Development Corporation won the small airports ARTS II systems, and Sperry UNIVAC won for the ARTS III.  This included the development testing at MSP.

## Slide 18 – Air Traffic Control

If you have flown on any commercial aircraft in the states since the late 50s, an ERA/Univac/Sperry/Unisys/Lockheed Martin/Leidos system has helped keep you safe!

At the bottom are the File Computers at enroute centers.

The Automatic Radar Tracking Systems are an adaptation of the NTDS IFF to provide controllers with radar 'blip' flight information via type 1218 computers.

ARTS III, the IOP first delivered in 1971 used a 750-nanosecond semiconductor memory and software with the same Instruction Set Architecture as the initial NTDS 30-bit processors.  Yes, the IOP (Input/Output Processor) hardware designed in the late 60s had a 40-year operational life!  The lead logic designer of the IOP was John Bonnes, a 1965 U of MN BEE graduate.

In 1993/94, the FAA and their contractors re-defined their system requirements (Advanced Automation Systems) to merge operations of 64 major airports, 125 minor airports and 23 enroute centers. AAS then morphed into the Common ARTS developed by Unisys using COTS tailored hardware.

## Slide 19 – Air Traffic Control, Sites

Here are where these 124 FAA owned systems are deployed.

FAA has had two development centers! One in New Jersey and the second at the MSP airport.  Quite a few UNIVAC, Sperry, Unisys, and Lockheed Martin personnel have spent time at the MSP control tower.  The most complex installation is the New York system that coordinates Newark, JFK, LaGuardia, and White Plains airports, the largest ARTS IIIE installation.

As the systems engineering for FAA evolved in the early 2000s, system maintenance was 'sold off' by Lockheed Marten to Leidos.
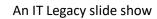
Liedos in Eagan is maintaining the systems yet today.

## Slide 20 – Anti-Submarine Warfare (ASW)

In the early 60s, there was a Cuban crisis as the Soviets tried to solidify their relationship with Cuba.  The Navy discovered that they were unable to keep tabs on various submarines moving 'stuff' to Cuba.

In 1962 the Navy wrote some specifications then tried technology with a UNIVAC ADD 1000 spaceborne processor, UNIVAC then developed the CP-823U for a test aircraft in 1964, then in 1966 contracted for the CP-901 pre-production processors to be part of the AN/ASQ-114 flying system.   The CP-823 and CP-901 had the same ISA as the shipboard 30-bit computers thus some OS and App re-use as well as minimum training!

Have you read Tom Clancy's book "*Hunt for Red October*" or watched the movie?  The Lockheed P-3C at the bottom left was the Lockheed plane carrying the AN/ASQ-14 system. This plane could fly three hours to a search area, do a 12-hour search mission, then fly 3 hours back to their land base.  The probe extending from the plane's back is a Magnetic Anomaly Detector, if a mass is detected but not sighted on the surface – sonobuoys are dropped to track the size and direction of the submarine.  The nose of the plane had infra-red sensors for cloudy and night detection of surface ships.  We had 'flying programmers' developing and testing the software.  This plane used the NTDS LINK-11 system for communications with their home station and any nearby Navy fleet.

   In 1997 we were contracted for the Anti-Surface Warfare Improvement Program. Shown here is civilian Unisys/Lockheed Martin female flying programmer Tricia Myhre. Military services of Canada, Norway, Netherlands, Australia, and Japan had variations of this system. 2012 comment about longevity, S3B and Canadians.

## Slide 21 – National Weather Service, etc.

Several government agencies required special systems designs to deliver solutions to the country.  The National Weather Service is one of them.
A U of MN graduate, Les Nelson, did the microcode for the PSP.
   As the defense industry budgets diminished, Unisys developed systems for the Postal Services – led by Dan Holste in Eagan.  Lockheed Martin transferred support for these systems to an East Coast facility.

## Slide 22 – Lawshe Memorial Museum

   In 2012, when Lockheed Martin announced the closing of their Eagan facility – the Dakota County Historical Society stepped up to establish a permanent exhibit of hardware artifacts that the committee had been collecting since 2006.  Thanks to then DCHS Executive Director Chad Roberts.
   We have a small cadre of volunteers at the museum every Tuesday morning cataloguing photos and documents contributed by retirees.  If duplicates are donated, paper items are donated to the Charles Babbage Institute.
   We have provided links to other museums that have artifacts and documents.  One has a Navy 642B computer, one has a Digital Trainer, one has a functional 1219B rescued from Johns Hopkins, and one has a 418 from NASA.

## Slide 23 – Tidbits and Factoids

1. The 1219's were a faster memory version of the 1218s.
2. As I understand it, Seymour Cray was part of the Athena computer design team, project engineer was Don Weidenbach.
3. If we had another hour or two – NASA used many 490 series computer systems as well as 1100 series machines supporting their control rooms.  The mission elapsed time clock is above the 418 machines, it shows 14 hours and 11 minutes.

## Slide 24 – Spinoffs & ERA Celebration

In 1986 Sperry celebrated ERAs 40-years with a booklet including the spinoff list shown at the left.  I do not know why they did bottom ups, ERA to Remington Rand to Sperry then UNIVAC.   Ramsey Engineering was an RRU spinoff then in 1957 Control Data.  UNIVAC and CDC small company spinoffs continued.  Cray spinoff from CDC was in 1972 near the top right column.
   Dave Lundstrom and Don Hall wrote about the spin off topic in their books.   Mr. Lundstrom had worked for both UNIVAC and CDC and was a VIP Club member.  Mr. Hall worked for CDC before his two decades as a stockbroker.

Then in 2021, Don Hall approached the Ramsey County Historical Society to create a plaque to recognize ERA's importance to the growth of technology in Minnesota.  We did an unveiling last June.

Two quotes from the plaque:

- "From this plant, an enormous contribution was made to human welfare throughout the world, and the benefits to the local economy are almost beyond measure.
- Technology came to rival agriculture and mining as a leading industry in the state."

## Slide 25 – ERA Recognition Ceremony

The ceremony was attended by current Unisys leaders.

I had invited Navy personnel, unfortunately Capt. Boslaugh was unable to attend. We had also invited Dr. Misa and current CBI Director Jeff Yost – both had schedule conflicts.

Excited to have the Navy there, especially one who had been there! _Read that he was in charge at the plant._

Rather neat that Bonnie Hill, daughter of the ATLAS engineer was there.

Speakers are shown at the top right, me for Univac/Unisys and others for CDC, Cray, and the medical industries.  Over 150 people there in spite of the heat.

## Slide 26 – ERA, First Computer Company – Irony!

The first ERA deliverable was a survey of what was happening in the US, including east coast research labs.

What is IRONIC?

_Read the slide paragraph_ – another Legacy paper notes that there was an IBM room in an ERA plant.

First Computer Company could be claimed by many organizations.  It should be known that as the computer industry was in its infancy, two office machine companies bought their way into the industry – IBM and Remington Rand.

As I have tagged ERA as the grandfather of Computers, Eckert Mauchly Computer Corporation, incorporated in 1947 would be the grandmother.

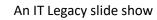## Slide 27 – Anthologies Tell the Story

January 2021, we posted the 15-year history of our legacy committee.

Since 2007, we have had a web site that has added stories as we gathered them including an article for the month linked above.

Our IT Legacy Anthology theme: People Engineering Computers and Systems at locations in Minnesota and throughout the world.  Over 600 people have contributed to the 60 chapters summarized in the 13-page article.

The Computer History Archives Project has independently generated YouTube videos – a few use our data.  The 32 videos are several hours of watching.

And prior to the TPT documentary, a history web site came out of CBI – coordinated by Liz Semmler.

## Slide 28 – ERA to Unisys Summary

Over $100 Billion in Economic Contributions to Minnesota – light blue line!

In 2008 our Legacy Committee put a bit of ERA to Unisys information out for public at the MN Sesquicentennial celebration and at the State Fair.

   This 4'x8' poster has the ERA founders at the left, early personnel and spinoff companies across the top. Seymore Cray's photo is included as is Sperry's first female director, Millie Gignac.

   If I can't answer your questions in the next few minutes – email them to me la.gj.benson@comcast.net and I will either respond with the answer or try to identify a retiree who is knowledgeable in the topic.

*Thanks to TwinSPIN for this opportunity to tell some of our history!*