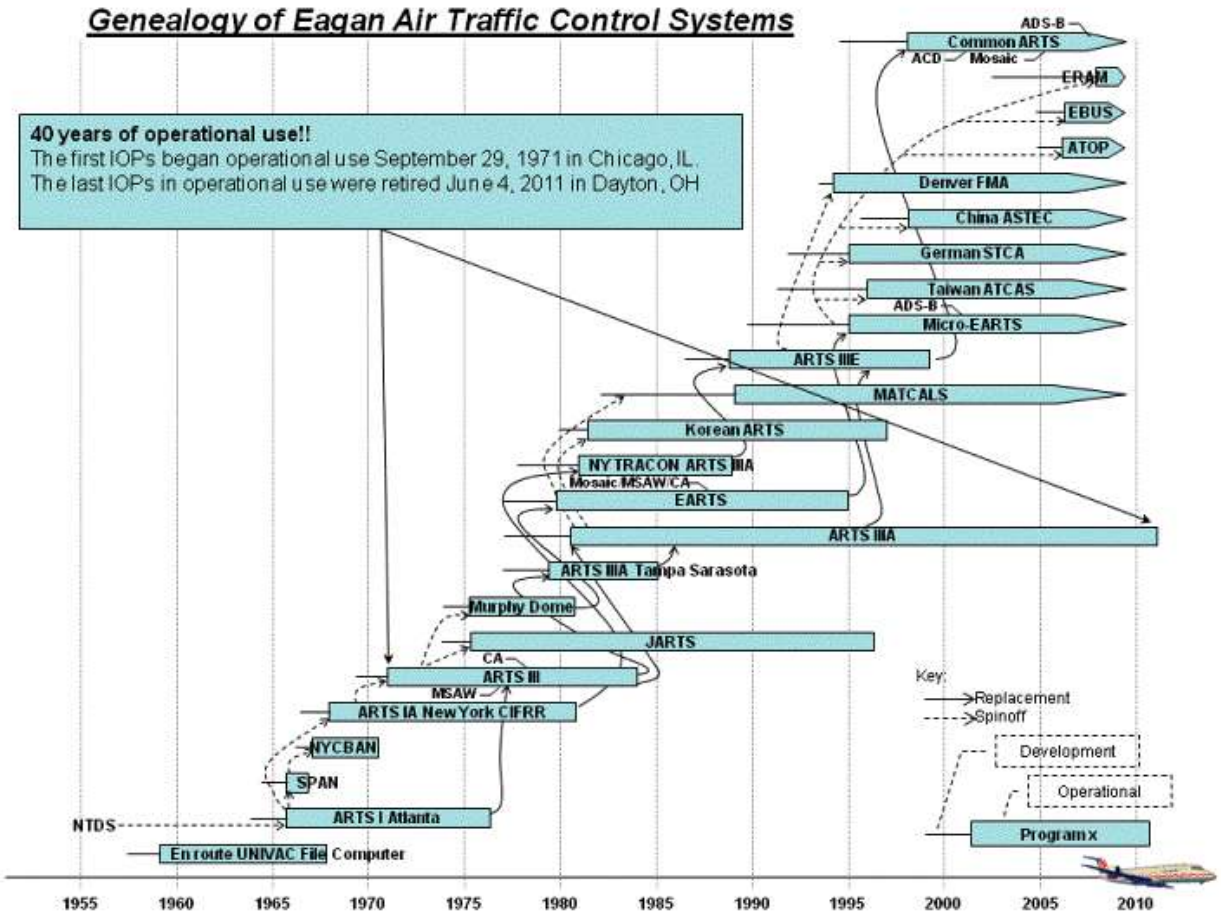
A Legacy Epoch

The Information Technology (IT) Legacy which began with Engineering Research Associates (ERA) in January of 1946 is gradually becoming known as the VIP Club Legacy Committee posts articles, project tidbits, and career summaries on our website - http://vipclubmn.org. Webster defines an EPOCH as: "A period marked by certain events." The genealogy chart below clearly illustrates a '40 years operational use' epoch within the 50+ year Air Traffic Control (ATC) Systems evolution which is a significant part of our IT Legacy. We write 50+ years because support of these Federal Aviation Administration (FAA) systems continues into the future at a Lockheed Martin leased facility in Eagan, MN.



Hundreds, if not thousands, of people have designed or worked on aspects of these systems. Congratulations to those engineers who designed the IOP (**I**nput **O**utput **P**rocessor) hardware and the programmers who did the systems, tracking, and display software. I'm quite sure that the 1970 engineering team, who were designing the IOP, could not have imagined that their designs would still be operational 40 years later! *The 'energizer bunny' fades quickly when compared to these 'UNIVAC' systems!*

The genealogy chart shows the entire Legacy evolution of ATC systems that had two 'parents':

1. Flight strip printing with a UNIVAC File Computer in the early 50's and
2. Automated Radar Tracking Systems (ARTS) from the Naval Tactical Data Systems (NTDS).

Before the IOP, the UNIVAC Type 1218 radar processing computer was the baseline for the ARTS I system in Atlanta, GA. The NTDS military designation for the 1218 was CP-789; UNIVAC commercial applications of this 18-bit Instruction Set Architecture (ISA) were identified as the 418 computer series. Along with the 1218 and IOP computers and operational software, UNIVAC/UNISYS supplied much of the ancillary equipments such as printers, buffers, etc. Although the first ARTS operational system was at the Atlanta airport, a complete test bed for systems development was at the Minneapolis St. Paul airport – many of our systems programmers spent time at that facility [originally called Wold-Chamberlin field.]

A few characteristics of the IOP are:

- ISA enhanced from the Navy's CP-642B, CP-667, CP-890, and CP-901 processors
- Designed for use as a multiprocessor or a stand-alone processor
- General purpose 30-bit processor
- Up to 16 input/output (I/O) channels
- Relative addressing and memory protect circuitry
- Addressing to 262,144 words of memory [30-bit words]
- Parity on all data transfer to memory from input/output buffering
- I/O chaining and automatic buffer capability
- Externally Specified Index (ESI) I/O channel capability

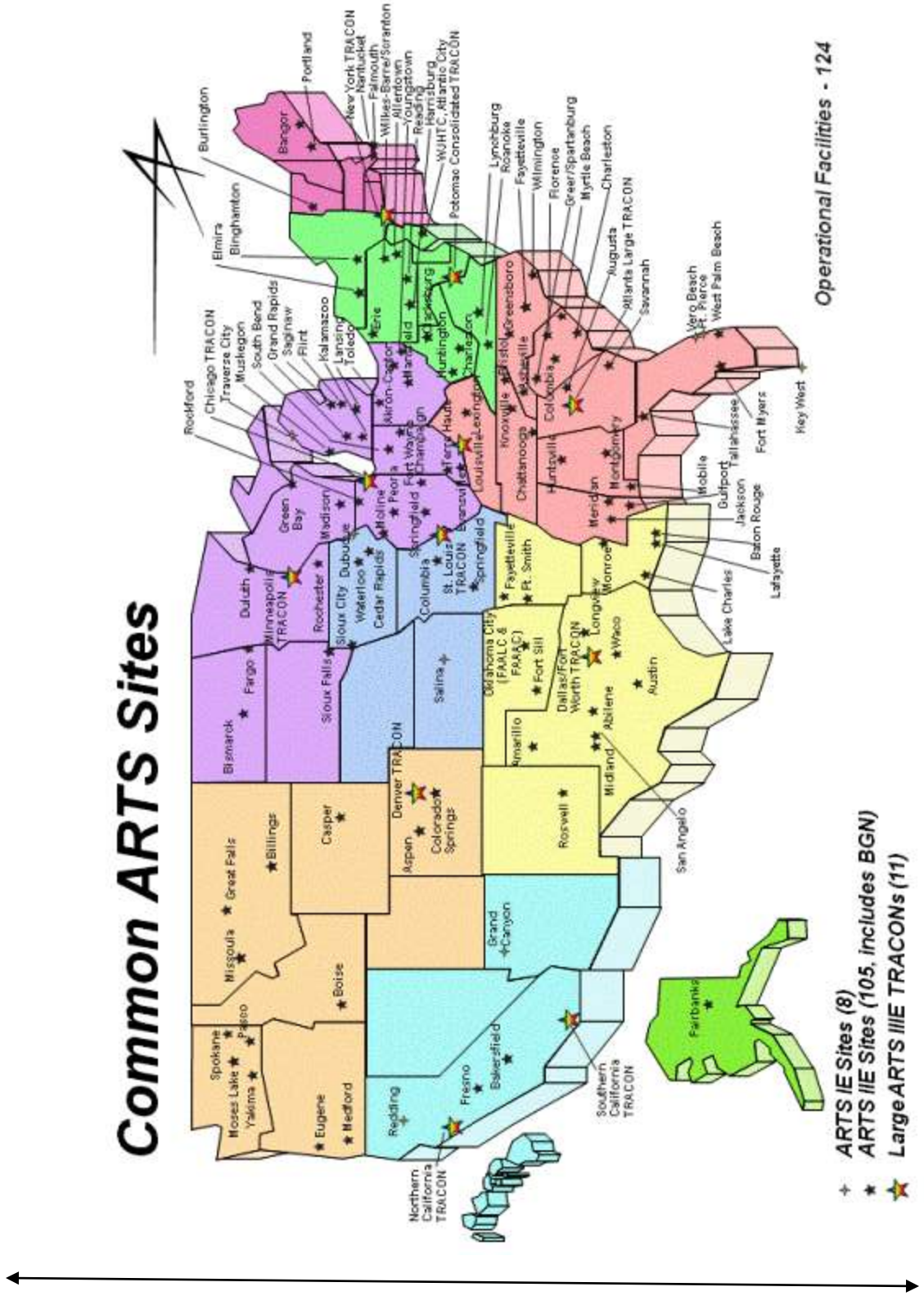
The genealogy chart shows ARTS I leading to ARTS III, which was enhanced to ARTS IIIA, then in turn to ARTS IIIE. The operational software was mapped and re-coded onto microprocessor based hardware as systems evolved from ARTS IIIE into today's Common ARTS systems. With each of these evolution phases came added systems capabilities.

A bit of history – in the 70's ARTS III was installed at 64 major airports in the US. At that time IBM was providing hardware and systems software to 23 en-route centers which did flight handoffs between those airports. In the early 80's, the FAA also had about 120 small airport systems built by Systems Development Corporation (SDC). In the mid-80's Burroughs bought SDC and Sperry to form UNISYS thus bringing the small airport and large airport tower systems together.

International spinoff applications of the UNIVAC/UNISYS/Lockheed Martin ATC systems went to Korea, Germany, Taiwan, and China. In the 80's we developed the Marine Air Traffic Control and Landing System (MATCALS); a ruggedized, shelter housed, transportable system which has been deployed into a few hostile action sites. Some of the newer ATC systems now include collision avoidance software, i.e. predict routes of on the ground taxiing planes in conjunction with landing/takeoff planes.

On the next page, a March 2012 chart locates the US associated Operational Facilities for which we've provided ATC systems, now operating as 'Common ARTS' systems. The New York TRACON facility coordinates take offs & landings at La Guardia, Kennedy, Newark, and two smaller area airports.

Yes, for 50 years, whenever & wherever we have flown, UNIVAC – UNISYS – Lockheed Martin ATC systems have kept US commercial flights arriving and departing safely!



Tom Montgomery provided charts and data for this article, written by Lowell A. Benson.