History of Information Technology at NASIC over the Past 40 Years

Contributing author Dave Lush

During the past 42 years, we have seen an incredible advance in information technology (IT). When I came to the Foreign Technology Division (FTD) in 1964, the organization's primary computing resource was a gadget called the IBM 7094. It was a single-thread mainframe that took in its "job stream" via magnetic tape and provided its output via magnetic tape. The available application memory on this mainframe was about 198 kilobytes (32K words with each word having 6 characters). This is in stark contrast to the typical 500-megabyte or more memories contained in the typical desktop computer today. The job stream for the old 7094 was imparted to the system's job stream tape by loading punch card decks to the tape via an auxiliary computer. Output print tapes were processed and printed via another supporting computer and printer. The operation was totally batch and there were no workstations and no disk storage devices.

In the mid-to-late 1960's, the 7094 was followed by several more advanced IBM mainframes (System 360s), which were capable of multiprogramming (having multiple applications resident in memory at same time) and supporting primitive user terminals. The 7094 was replaced in 1972 with a multiprogramming, multiprocessing system from UNIVAC that could accomplish seven times the batch work that the 7094 was capable of. However, the UNIVAC system provided for the first corporate online computing, complete with a file management system and a file editor and online cathode-ray tube (CRT) terminals. This represented a major leap forward.

There is an interesting story associated with the UNIVAC era. A few years after we acquired the UNIVAC—around 1978 or so—we had maxed its disk storage. The Technical Director convened the technical staff to deal with this problem and, after an afternoon's worth of discussion, he decided that we would double the amount of disk storage that we had on hand. After making this decision, all involved reached the conclusion that when the total disk storage was doubled, we would never need to procure any more disk storage ever again! Our decision to double our disk storage would bring our holdings to a grand total of 3.2 gigabytes. And this amount of storage required a basketball-court-sized room to house it! Of course, we know how storage technology has evolved since then.

In the very early 1980's, a small fledgling software outfit called Oracle had our attention. Oracle had developed a newfangled approach to data base management capability based on the theoretical constructs of relation theory. During that period, a fellow named Larry Ellison (now the CEO of Oracle Corporation), driving a rent-a-wreck, came to NASIC (FTD in those days) to personally install the second beta version of the Oracle relational data base management system (RDBMS) capability to be installed in the United States. Of course, in those days, very few folks knew who Larry Ellison was. Now he is one of the wealthiest people in the world.

In 1983, the UNIVAC system was replaced by latest IBM mainframe capability with hundreds of CRT terminals. In about 4-5 years, virtually everyone had on his/her desk a personal computer (PC) that was directly connected to the mainframe. This period was a breakthrough period during which access to corporate computer power went from using a dumb terminal in one of several terminal clusters located throughout the building, to using your own desktop PC connected to the corporate mainframe.

In 1990, the advent of UNIX-based client server computing occurred, and by the mid-1990's, we had pretty much gone to the UNIX client server paradigm and architecture. But in 1996, we introduced Windows capability into our environment, and this initiative was not without its difficulties in terms of overcoming culture and gaining the competencies/skills we needed to cope with the new Windows-based capabilities.

In general, the period from 1993 to 2000 was a painful one for NASIC IT because we were pinned down by DODIIS migration (a community-wide application consolidation initiative) and Y2K (year 2000) chores. Further, our resources were diminishing as our client elements began to do more and more IT things themselves.

In spite of NASIC IT's troubles in the 1990's, one absolutely monumental thing that happened was the advent of basic web technology in the form of the web server and the web browser. To be more specific, on 15 April 1994, NASIC along with about 15 other Department of Defense intelligence sites launched very primitive web content via the JWICS network. This composite of sites was (and is still) called Intelink. I can remember looking at the various web pages from participating sites and thinking that we had just accomplished with freeware something we had been dreaming about for the last 20 years.

Of course, nothing has been the same since the advent of Intelink. There have been several subsequent "waves" of web technology wash over us and now we are entertaining so-called web-services-based architectures, in which various players in a community of interest (COI) can invoke and/or provide various services/data to other players in the COI, and thereby execute the overall operational architecture of the COI. This is the essence of the so-called "net-centric" paradigm that is currently in vogue. I believe it will remain in vogue because it is a very powerful concept!

In the post-Y2K era, NASIC has been able to mount and sustain a viable IT recap program. The technology involved includes Windows-based desktop workstations, usually including multiple switchable PCs connected to multiple networks. It is interesting to note that each desktop system provides perhaps 10,000 times the processing power that the entire UNIVAC mainframe provided in the 1970's. The desktops are supported by Gig-Ethernet communications running over a fiber network and connecting desktops to a mix of Windows and UNIX servers in the backroom.

And storage capabilities are provided via so-called storage area network (SAN) technology, which provides for a storage network to connect servers and storage devices on the back-end of the servers.

Further, NASIC has undertaken an initiative to establish a knowledge-based approach to intelligence production. This is based on the conceptualization of information models of the threat and information-model-driven capture of the threat knowledge; and the subsequent approach also involves subsequent access, dissemination, and presentation of this prepositioned threat knowledge by so-called "virtual product" components, which in turn are combined to make up dynamic web portlets that convey the required intelligence in the required form to a particular community of interest. This new knowledge management based approach is made possible by the latest advances in web technologies and in RDBMS capability from Oracle, which NASIC started using in the very early 1980's, when Larry Ellison came to NASIC to personally install a beta version of Oracle.

The oft-quoted Moore's Law states that computing capacity will double every 18 months or increase about 100-fold over a decade. This means that over my time at NASIC, that computing capacity would have increased about 8 orders of magnitude! My initial reaction to this prognostication was that it's not possible and hasn't happened. But a little research and some simple calculations will reveal that it is basically true! For example, we have gone from kiloflops (1,000 floating point operations per second) of computational power in 1964 to teraflops (one trillion floating point operations per second) in 2005. And we have gone from a few megabytes (millions of bytes) of disk storage in the mid-1960's to petabytes (quadrillions of bytes) in 2005.

In looking back, I would say that perhaps the most noteworthy IT accomplishment at NASIC occurred in the early to mid-1980's, when Chuck Mangio, who was the tech director for the computing directorate at the time, led the organization to the unprecedented enterprise-wide application of IT. More specifically, Mr. Mangio's leadership resulted in the deployment of a PC to the desk of every member of NASIC. Further, these PCs were directly connected to a large corporate mainframe, providing each user with both PC and mainframe computing environments at the same desktop. This achievement had profound implications for NASIC because it basically opened the door to enterprise-wide computing for NASIC.

I am compelled to mention one other amazing accomplishment that I appreciate much more after having experienced 4 decades working in IT. When I first came to NASIC in 1964, I soon started working in the imagery domain on so-called mensuration model software. This was the software that received film coordinates from film readers and calculated actual geometric dimensions of the objects imaged in the pictures. These mensuration models were executed in a system called the mensuration control system (MCS). MCS was amazing considering the era in which it existed and operated! Why? Well, MCS was a no-kidding, online multiuser, time-sharing system with remote terminals that enabled the MCS user to call up mensuration routines, capture the film coordinates of objects in the images, and calculate the requisite object dimensions.

MCS ran on a computer called a READIX. There were only three of them in the entire world! The READIX was built on first-generation technology to include relays, vacuum tubes, rotating storage drums, etc. When one entered the READIX room, one would hear the relays clacking and see the vacuum tubes blinking. The READIX had no program memory, but rather the application instructions and the application data were placed at just the right places on the rotating drum so as to provide the instruction and data at the right times to the READIX's central processor. The utterly amazing thing is that a fellow named Burt Hultz, who was a legendary imagery exploitation guy at FTD, developed the multiuser, interactive, online, time-sharing system MCS on the READIX computer basically on his own! Amazing! God bless Burt!

At the time of this writing, we are not severely limited by lack of powerful information technology, but rather our most noticeable limitations involve dealing with reticent culture and envisioning *what* we want to do with the awesome IT that we have at our disposal.