

## THE RADAR IS ACTIVE

"The radar is active. All systems are on-line. We have a valid signal. There are multiple in-bound targets. Missile count is 14, check 16. Initiating track analysis."

A young Air Force captain has his attention totally focused on a radar screen in the Missions Operation Center of the Air Force 6<sup>th</sup> Space Warning Squadron early warning radar facility in Cape Cod, MA. His words portend the imminent nuclear annihilation of the eastern United States.



It is a remarkable facility. The two fixed radar faces stand ten stories high. Their beams are steered electronically and reach out 3,000 miles from Cape Cod to classify and track space objects as small as a Volkswagen.

Even though this is a simulation, the emotional impact of what we are seeing and hearing is surprisingly intense. This is truly frightening to witness.

We are here to participate in the demonstration of a new computer system being installed at the site by ITT and Northrop Grumman for Air Force Space Command. This computer receives and processes the radar data and presents it to the radar operators. It will replace a vintage 1970's CDC (Control Data Corporation) Cyber mainframe computer that has become increasingly difficult to maintain as the supply of spare parts dwindles.

The new and old computers sitting in the same room of the operations center offer dramatic testimony to the impact of Moore's Law on the evolution of computers (in part, that computer performance doubles about every 18 months). The two older Cybers (a primary and a backup) along with their peripherals, controllers, power supplies, and water cooling systems occupy a space equivalent to two racquetball courts and weigh more than 30,000 pounds. The two new computers (modern Hewlett-Packard servers, with four Intel Itanium2 processors) each occupy about six inches of rack space in a small 19 inch rack and weigh about 30 pounds. When the older computers are finally powered off, the savings on electricity and cooling at the facility will be tremendous.

The migration from old computers to new has only taken about two years – an incredibly short period of time for a system this complex and involving more than a million lines of software. The key is Northrop Grumman's patented RePLACE technology that emulates the characteristics and behavior of the older computer on the new one, thus allowing the existing mission software to run on the new computer without modification. A traditional software rehost would have taken five or more years with a team of 120 software engineers and a cost of over \$150M. The use of RePLACE reduced the software cost by more than 85% (\$22M) and fully leveraged the years of testing, operations, and maturity of the existing software.

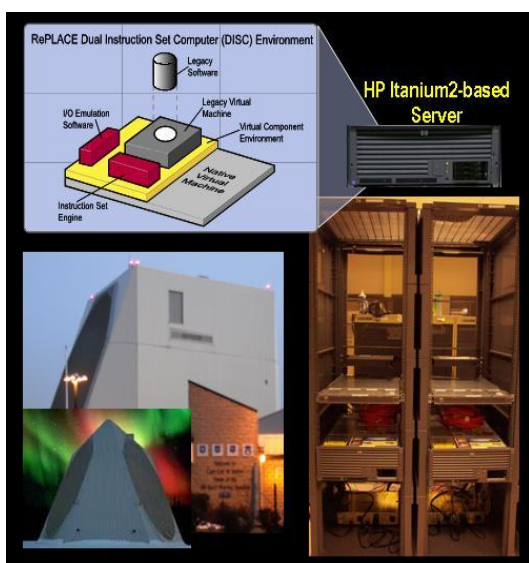
Training of the radar operators and computer operators is also significantly reduced because the operating system and mission software behave almost exactly the same on the new computer as on the old.

The simulated mission scenario we witnessed at Cape Cod took place only three weeks after the new computer hardware arrived at the site – a tremendous testament to the quality of the engineering and system integration work performed by the ITT and Northrop Grumman team. A second RePLACE-based upgrade is also being installed on the radar system in Clear, AK.



ITT performs sustainment and modernization of the Cape Cod and Clear sites and many other radar systems for the United States Air Force on the System Engineering and Sustainment Integrator (SENSOR) Program. This work on the radar systems at Cape Cod and Clear is being performed by the BMEWS/PAVE PAWS Product Line located in the ITT Colorado Springs, CO office under the SENSOR Cyber Legacy Emulation Upgrade (CLEU) project.

The CLEU project was initiated as a backup plan by the US Air Force to reduce risk on a larger program designed to upgrade the computers and radar systems at all five of the BMEWS/PAVE PAWS sites. To mitigate this risk, the Air Force tasked ITT to deploy the CLEU system to Cape Cod and Clear as an interim measure to avoid a serious Cyber failure while waiting for the other radar system upgrades.



The RePLACE technology used in the CLEU system has enabled ITT SENSOR to provide the Air Force with some additional benefits. Software sustainment efforts are reduced because RePLACE includes a modern integrated development environment for legacy software that allows ITT software engineers to troubleshoot and maintain software more efficiently. It also enables software changes and additions to be written in modern programming languages and be seamlessly integrated with the legacy software. This feature permits ITT software engineers to update or replace legacy software components one piece at a time and brings about a new paradigm for modernizing older systems in an evolutionary fashion instead of starting from scratch. ITT SENSOR has successfully applied this approach to other radar programs to significantly reduce modernization costs and offer increased value to the Air Force.

Fortunately, normal day-to-day activities for the crew and their radar system at the Missions Operation Center in Cape Cod, MA are usually filled with the more mundane tasks of tracking space launches from Florida and keeping track of various satellites, space debris, and occasional space voyagers as they orbit the Earth. Imminent nuclear annihilation of the eastern United States is not an everyday event. Our great country is in good hands.

**Note: L-3 Engineering and Technical Services is a subcontractor to ITT and provides Configuration Management, Drafting, Logistics and Testing Support to this critical BMEWS/Pave Paws Product Line project.**