

# FORTRAN - Lockheed Martin - I-SPAN SWPS

Lockheed Martin (LMCO)

Integrated Strategic Planning & Analysis Network Modernization (ISPAN)

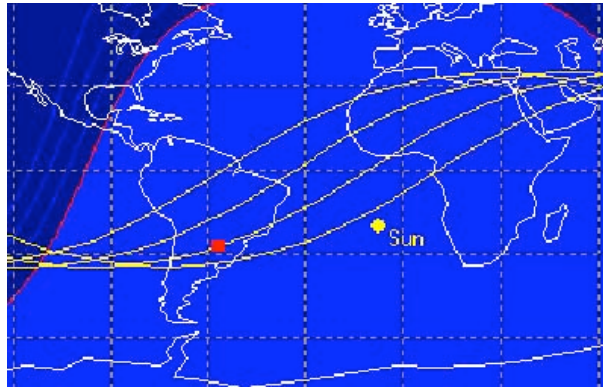
Missile Graphic Planning System (MGPS)

United States Strategic Command (USSTRATCOM)

## Fortran to C++

**History:** United States Strategic Command (USSTRATCOM) Integrated Strategic Planning & Analysis Network (ISPAN) uses a net-centric operational war construct to integrate data from space-based, ground-based, and airborne sensors to provide real-time global situational awareness, alerting commanders to potential threats. For each new threat, the system provides a set of different responses complete with estimates for success probability,

collateral damage, required resources, and time frames. Commanders are then able to provide a swift response in coordination with regional Combatant Commanders. The Missile Graphic Planning System (MGPS) system is one of several ballistic missile planning tools that operate within the ISPAN computer environment and must operate seamlessly with other elements of ISPAN. The Software Revolution, Inc. (TSRI) was a member of the Lockheed Martin (LMCO) team bidding on the ISPAN modernization program. TSRI's role was to demonstrate the technical feasibility of fully automated approaches to re-engineering and transitioning classified modules from the MGPS system into an open, flexible, scalable, and extensible software environment.



**Challenge:** The demonstration for USSTRATCOM took place in Nebraska at a LMCO Secure Information Facility (SCIF) near Offutt Air Force Base. Security restrictions required placement of TSRI's *JANUS*<sup>™</sup> software re-engineering toolset in the SCIF to be run by LMCO personnel with appropriate security clearances. LMCO required training on *JANUS*<sup>™</sup> and remote assistance from TSRI software engineers to successfully perform this transformation, re-factoring, and assessment pilot. The I-SPAN demonstration illustrated fully automated modernization by transforming 80,000 lines of FORTRAN from an MGPS module into C++. The transformation required no post-transformation manual modification and was followed by clean (error-free) compilation and linkage. The resulting transformed module was then tested using a classified data set, which simulated 80% of possible execution paths. The I-SPAN feasibility demonstration continued with automated complexity assessment followed by complexity-driven re-factoring operations. Following these automated and semi-automated re-factoring operations, *JANUS*<sup>™</sup> was used to assess the modernized module, illustrating its capability for automatic generation of up-to-date UML "To Be" documentation.

**Result:** TSRI and LMCO personnel carried out a highly successful demonstration in December of 2003. TSRI supplied the *JANUS*<sup>™</sup> tool set, including the operating system and all necessary supporting software. This software was hand carried using CD-ROMs and installed in the non-network environment of LMCO's SCIF. LMCO engineers carried out tool preparation and testing, with TSRI engineers providing remote assistance. Once set up, the LMCO engineers applied *JANUS*<sup>™</sup> to automatically transform the 80,000-line FORTRAN test sample into C++. In the final demonstration it took only 20 minutes to automatically transform the legacy FORTRAN into a functionally equivalent C++ module.

The TSRI/Lockheed Martin pilot demonstrated the low risk, highly efficient software modernization capabilities of the *JANUS*<sup>™</sup> toolset. It also illustrated the practicality of remotely using *JANUS*<sup>™</sup> on secure computers in a non-network environment. LMCO received high marks for risk mitigation and was awarded a \$213 million Research & Development contract for ISPAN on August 26th, 2004. This began an evolutionary acquisition using a spiral development approach supported by TSRI's *JANUS*<sup>™</sup> toolset. Teaming with LMCO and other

ISPAN related contractors, TSRI will target C++ and Java as it transforms the legacy FORTRAN, Ada and PowerBuilder associated with ISPAN.