

Innovation

SBIR Topic Number:
AF06-062

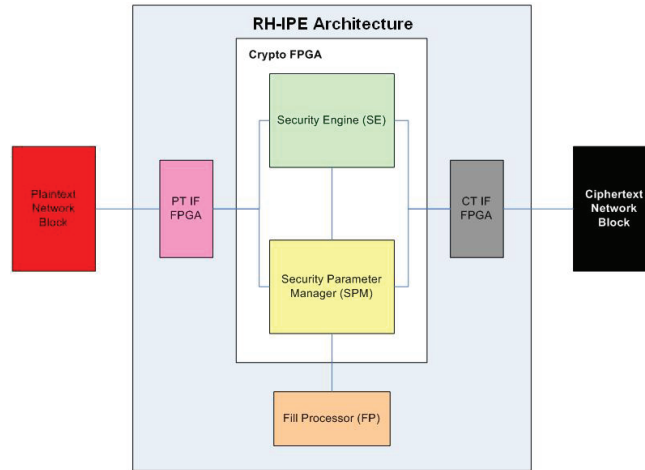
SBIR Title:
Reprogrammable High Assurance Internet Protocol Encryptor

Contract Number:
FA8750-07-C-0059

SBIR Company Name:
Space Micro Inc.,
San Diego, CA

Technical Project Office:
AFRL Information
Directorate, Rome, NY

This Air Force SBIR/STTR Innovation Story is an example of Air Force supported SBIR/STTR technology that met topic requirements and has outstanding potential for Air Force and DoD.



Block diagram outlining the Radiation Hardened Internet Protocol Encryptor architecture

Radiation Hardened, Reprogrammable Internet Protocol Encryptor

- The Air Force needs new generations of hardened space qualified bulk and packet encryption/decryption devices to provide secure transmission of data for a wide range of satellite programs
- Space Micro designed and developed a Radiation Hardened Internet Protocol Encryptor (RH-IPE) that is capable of encryption rates beyond 10Gbps and will have a flight lifetime greater than 10 years
- The technology is based on a highly redundant architecture, where all critical functions are performed in parallel using similar logic that operate independently, with all critical decisions compared by redundant check functions to assure 100% consistency of results
- It is ideal for any advanced space-based communication system, particularly laser communication, which has high data rates and requires encryption for transmitting sensitive information

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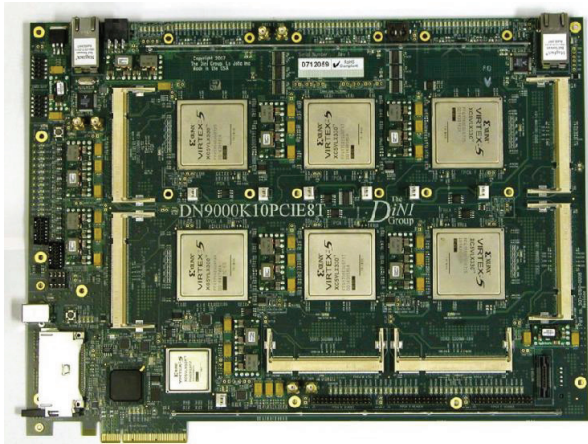
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Air Force Requirement

As military satellite communication systems continue to evolve, new generations of hardened space qualified bulk and packet encryption/decryption devices will be required to provide secure transmission of data for a wide range of satellite programs. This is particularly true for the Air Force as sensitive data transmission via satellite is becoming increasingly popular.

SBIR Technology

Under this Phase II SBIR project, Space Micro designed and developed a Radiation Hardened Internet Protocol Encryptor (RH-IPE) that is capable of encryption rates beyond 10Gbps and will have a flight lifetime greater than 10 years. The design of the RH-IPE fell into several elements: encryption algorithms, encryption key exchange, crypto field programmable gate array (FPGA) content, fill FPGA content, interface FPGA separation, and radiation hardening. The RH-IPE is radiation hardened in order to mitigate the effects of a harsh space environment – including Single Event Upset (SEU), Single Event Latchup (SEL), and Single Event Functional Interrupt (SEFI) – making it suitable for satellite communication systems in any orbit.



Radiation Hardened Internet Protocol Encryptor Board

The technology is based on a highly redundant architecture, where all critical functions are performed in parallel using similar logic that operate independently, with all critical decisions compared by redundant check functions to assure 100% consistency of results. The RH-IPE will provide secure, reliable, high speed data encryption for high data rate space based satellite communication links.

Potential Air Force Application

The RH-IPE has a broad range of Air Force applications due to its radiation hardness and high quality cryptographically-based security performance. It is ideal for any advanced space-based communication system, particularly laser communication, which has high data rates and requires encryption for transmitting sensitive information.

The projected popularity of laser communications and the utilization of increasingly sophisticated encryption algorithms in radiation harsh space environments means that the RH-IPE will fill an important role in many future Air Force applications, including the growing number of small and nano satellites. Moreover, due to its radiation hardness, it will work well for satellites in almost any orbit.

Company Impact

This project has given Space Micro the opportunity to develop high speed, radiation hardened, data encryption technology, which will be increasingly necessary on satellites as laser communication and widespread data encryption becomes more popular. While this is highly relevant to the Air Force and other military satellites, it also will directly benefit commercial satellites that will handle highly sensitive commercial traffic such as banking information. It is possible that encrypted laser communication systems will be used on hundreds of future satellites, and Space Micro will be well positioned to provide reliable radiation hardened data encrypting systems for them.

Furthermore, this project has furthered Space Micro's extensive experience in radiation hardening technology for space components in harsh environments. It complements other Space Micro R&D as well. This includes modifications to Space Micro's H-Core2 radiation hardened FPGA, proving that the technology can be used for a wide variety of applications.

Space Micro is a high technology firm with a special focus on space and military applications. Founded in 2002, Space Micro is a privately held, employee-owned company, with headquarters in San Diego, California. It is a pioneer in providing radiation hardened by design solutions for advanced electronic systems and microelectronics.



SBIR/STTR

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