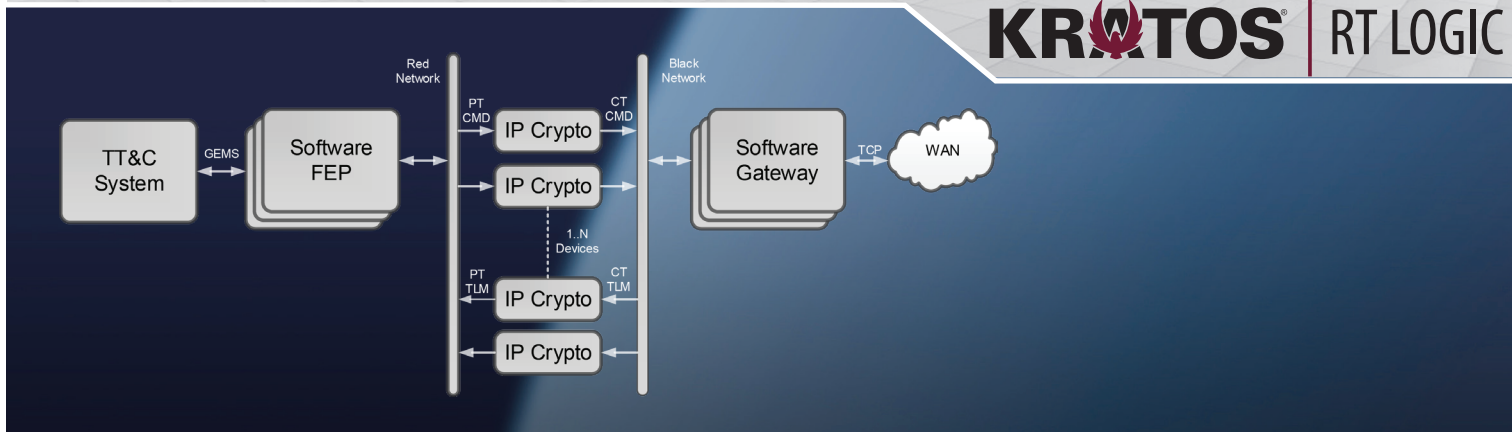


Software FEPs and Gateways

Virtualized Ground System Operations

KRATOS | RT LOGIC



Overview

Front end processors (FEPs) and gateways have been traditionally used to provide a standardized interface to the cryptographic device in the encryption of commands and decryption of telemetry from the space vehicle. The FEP sits between the command & control (C2) system and the red-side of the crypto, while the gateway interfaces the black-side of the crypto to the network across which commands are sent and telemetry received. In the past, legacy cryptographic devices have been serial devices for both the transfer of commands or data and control and status of the device itself. This serial interface has required the use of a dedicated hardware based FEPs and Gateways running custom hardware and/or firmware.

Newer cryptographic devices are internet protocol (IP) based, eliminating the requirement for serial cabling and allowing traditional network communications to the crypto. With the elimination of the serial interface, the FEP and Gateway can become pure software solutions, leveraging virtualized infrastructure.

In our Software FEP and Software Gateway products, Kratos RT Logic has migrated our proven T501 FEP and T500GT algorithms into a pure software baseline. The software solution supports virtualization environments, such as VMware vSphere, and its small memory footprint allows for the efficient use of system resources. Platform independence is supported by the elimination of dependencies on custom drivers, firmware, and hardware cards. Scalability and optional support for blade-server architectures allow for meeting expanding requirements as satellite constellations grow over time. Kratos RT Logic continues to support the standard GEMS interface, allowing for backward compatibility with our T501 and T500GT product lines and enabling a smooth transition to the newer IP-based ground system networks.

Key Features

- Small memory footprint
- Runs in RT Logic or customer- provided hardware platform
- Easy to use GEMS or REST interface
- Platform independent - supports emerging blade-server architectures

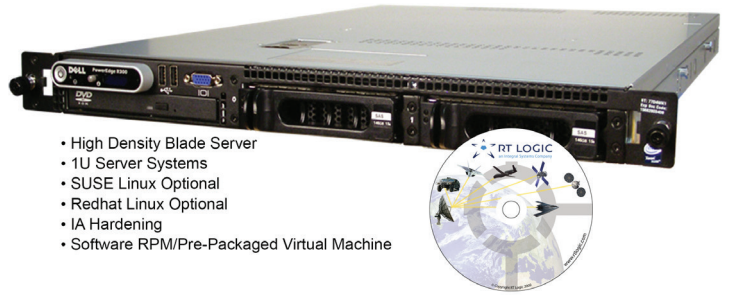
Proven Benefits

- Efficient use of system resources
- Scales easily to support growing constellations
- Supports asset pool management
- Supportable for the long term

Widely Trusted

- Satellite manufacturers and operators
- Civil, commercial, and military

Kratos RT Logic has successfully delivered the primary operational FEP and Gateway as pure software instances on major programs, including the next generation of ground systems supporting the GPS constellation of position, navigation, and timing satellites and NASA's Tracking and Data Relay Satellite System (TDRS). In both of these systems, the Software FEP was used with the KS-252 cryptographic device and controlled the intelligent routing of data through an asset pool of KS-252 devices.



- High Density Blade Server
- 1U Server Systems
- SUSE Linux Optional
- Redhat Linux Optional
- IA Hardening
- Software RPM/Pre-Packaged Virtual Machine

A disadvantage of internet-based protocols is the non-deterministic nature of the communication channels. Lags in communication can occur when buffering of data is required. Unfortunately, this behavior is not acceptable for many of the typical satellite ground control software suites. Satellite communication must be predictable; many applications require positive validation of command success through observation of expected satellite telemetry changes within a constrained period of time. In addition, some space vehicles require specific timing of receipt of commands or accurate time stamping of received telemetry.

Kratos RT Logic has solved these problems by passing metadata around the cryptographic device through our CyberC4:Guard product, which provides a proven cross-domain solution when red-black separation is required. This approach uses Kratos RT Logic's guard rule sets to meet timing requirements across the red-black interface. Furthermore, the CyberC4:Guard allows for control and status of downstream equipment to be operated from the red C2 system. Where ground segments were once dominated by physical racks of equipment, Kratos RT Logic's Software FEP and Software Gateway products can consolidate a large number of strings of capability into minimal physical space. Consolidation not only improves use of the communications center floor space, but also reduces equipment power and cooling requirements.

