SOFTFEP™

AFSCN Mission Integration Test System

Description and Application

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This document includes AMERGINT's product design information.
We ask that you use the information solely to evaluate our products.
We also ask that you prevent unauthorized disclosure.

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Introduction

In 2012, the Air Force 50th Space Wing, 22-SOPS Mission Integration Team approached AMERGINT with the need to obtain a robust testing capability that could be used for verifying any new or existing program that had connectivity issues with the AFSCN WANIU. This test capability needed to completely emulate remote tracking station behavior and appear to the user as if they were connecting to and controlling a real ARTS. The answer to their needs is the AMERGINT AFSCN Test Bed. This test bed is presently used to verify the functionality of any interface device connected to the AFSCN. The AMERGINT AFSCN Test Bed is truly the system by which all AFSCN interface devices are measured.

This document provides summary information on the AFSCN Test Bed functionality. We hope it provides the information needed to evaluate each of these options. If we can provide additional information, please call or email.

softFEP Processing Architecture Familiarity

softFEP Applications use processing chains that link and order our Software Devices (SwDs). There are more than 750 SwDs in the product line. The ARTS Simulation and ARTS Interface SwDs are within this extensive SwD library.

Each SwD performs an 'atomic' processing function. By atomic, we mean they each perform a singular function. This makes them highly reusable. The flow-based, functional software architecture uses a technique known as transformative programming. Within the processing chains, the SwDs connect to one another via direct software interfaces to efficiently process and move data through the system.

The softFEP systems contain multiple processing chains that are collected together to form the softFEP Application (App). Apps can be stopped, started, and switched much like applications on today's smart phones. The operating system is Linux, and the softFEP App can be hosted on a rack-mount server, blade server, or laptop. The software can run in a Virtual Machine.

The architecture is fully scalable. The design architecture is modular (loosely-coupled) and easily scaled up or down. There are softFEP Apps with more than 1000 SwDs and 50+ processing chains.

AFSCN Test Bed Applications

The AFSCN Test Bed is a small rack system that consists of two independent host processors (Dell R310 or equivalent). Each of these host systems is configured with the same set of AMERGINT built applications. There are four (4) applications that can be selected.

1. **Ground Mode AFSCN Interface** – This application provides the SOC mode AFSCN interface capability. The app includes the ability to generate TxBERT commands, convert those commands into ternary, incorporate and transmit those commands over ADCCP format C/C/S. The app also provides the capability to receive those commands back as echo for decomposition and receipt processing through an RxBERT. This provides full-loop command testing capability through a real RTS, or through an RTS Simulator. The system also provides the capability of transmitting and receiving EXU, and two (2) streams of downlink telemetry or output simulated telemetry streams. The application also includes the ability to generate antenna pointing angles and include those in the appropriate sections of the C/C/S stream.

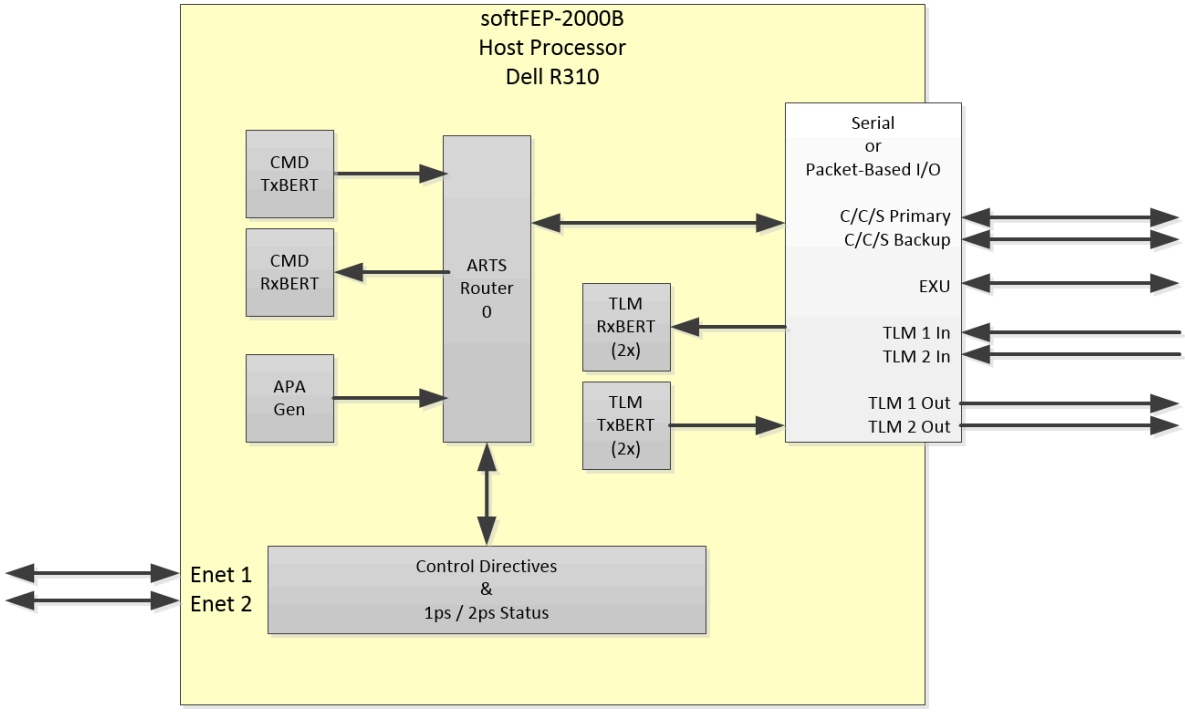

Figure 1. Ground Mode AFSCN Interface App Architecture

2. **Simulation Mode AFSCN Interface** – This application is configured to function as a robust RTS Simulator. This mode includes the ability to receive ARTS directives, and provide the associated response via once and twice per second status per the ICD-00508. Included is the 22-SOPS Mission Integration requirement to parse the S/V command from the C/C/S stream, convert the command to EXU format, and serialize the output for transmission to either a real RTS, or an RTS simulator. As is true with any AMERGINT application, the ability to bring in any stream in one format and output in another is a standard feature of our architecture.

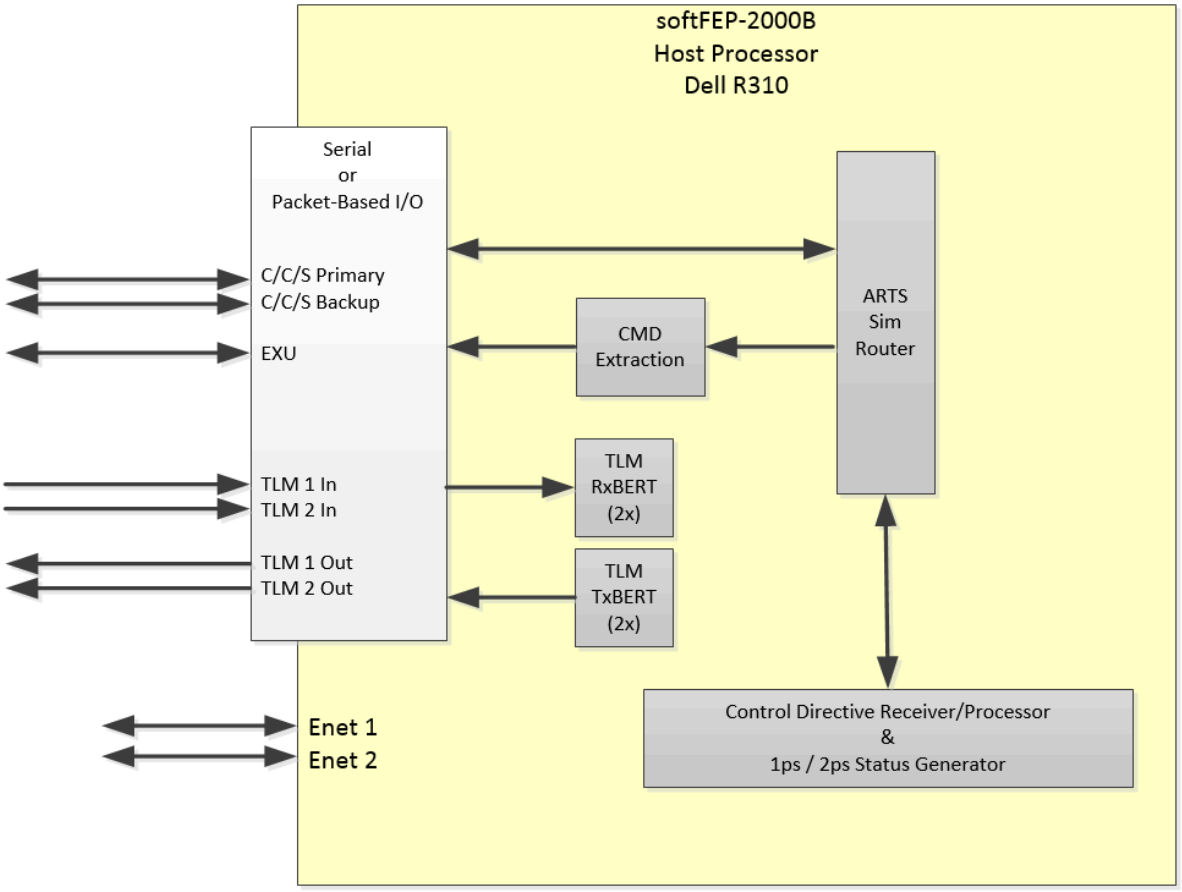

Figure 2. RTS Simulation Mode App Architecture

An important note with respect to the ARTS Sim Router SwD. This SwD is constructed using a modular approach making it very flexible and configurable for a multitude of applications. The ARTS router consists of a chain design with each functional block only paying attention to a specific part of the ICD-00508. Each SwD is only looking for a particular section of the C/C/S stream. If it doesn't apply, then the data is passed on. Once applicable, the SwD processes the data according to configuration. This flexible design combined with the Control Directive Receiver/Processor and 1ps/2ps Status Generation SwD, allows the simulator application to be used as a powerful ADCCP control and status processor that

functions like the LIP. This chain can be used to control and status functional RTS equipment such as modems and antenna control units. This application easily transforms into the front-end processor for deployable ARTS systems. Included below is a SwD chain diagram of the ARTS Sim Router. It's easy to see how the chain is constructed making it easy to break down the ADCCP protocol as defined in the ICD-00508.

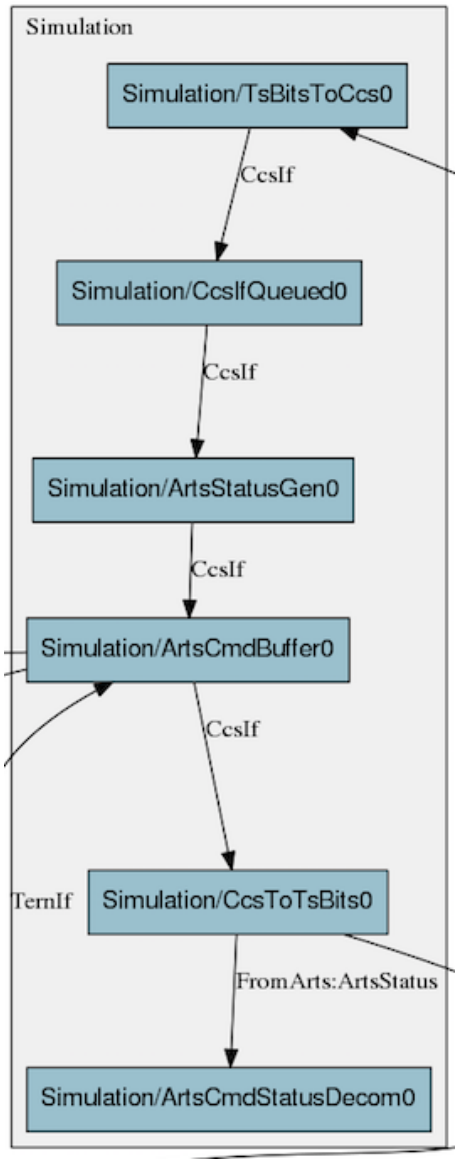

Figure 3. ARTS Simulation Router Chain Diagram

3. **Multi-Channel Recorder** – A Multi-Channel Recorder application is provided for record and playback of inbound and outbound ARTS directives and status, outbound and inbound EXU, and telemetry.

In addition to the recording capability, we've included ring buffers in every mode that captures ADCCP C/C/S and 1ps / 2ps message traffic as they occur combined in a single file. This makes our applications function exactly like legacy Protocol Analyzers. This provides the capability to evaluate message traffic for quick anomaly detection.

4. **Multi-Channel Tx/Rx BERT** – Provides a simple multi-channel Bit Error Rate Tester (BERT) for general purpose testing applications.

Two Systems with A Powerful Set of Tools

Consider a scenario with two host platforms each with these four applications selectable. Once system can be set in AFSCN Ground Mode and the other in ARTS Sim Mode. This allows local testing of one machine against another.

Another scenario where an external user is connected to the ARTS Sim Mode and the 2nd system is set up as a multi-channel recorder and able to capture the entire session for official integration testing.

Yet another scenario where BERT applications are running with real ARTS and recording. Very powerful combinations.

Thanks for reading all the way to the end! Please give any of us your feedback on this white paper, learn more, and even see a demonstration of the product.