S-PLANE

XSIM2-SDK

Software Development Kit

Features

Overview

- Flexible real-time software development environment for safety-critical S-PLANE Hardware
- Safety-certifiable framework with Run-Time Environment (RTE)
- SDK Libraries and Tools to build applications and support development
- Leverage proven S-PLANE software add-ons (components and applications) to accelerate development
- Scales as programme requirements evolve

XSIM2-SDK Target Hardware

- NX-FCU: Dual high-performance flight computers, data concentrator, network switch, storage, and optional integrated sensors and comms
- X-CUBE: Dual/triple high-performance flight computers, data concentrator, storage, and integrated redundant power distribution

Overview

XSIM2-SDK is a flexible, open-architecture Software Development Kit (SDK) that provides an environment for developing safety-critical, real-time software for deployment on S-PLANE hardware. It extends S-PLANE's target hardware by adding a Run-Time Environment (RTE) on top of the Real-Time Operating System (RTOS), together with SDK libraries, tools and add-ons that support application development and accelerate software development.

At the heart of XSIM2-SDK is the Run-Time Environment (RTE), a structured framework for connecting and executing RTE Components and Applications developed using Model-Based Design (MBD) or traditional software development methods. This allows developers to create custom software within an established, safety-certifiable framework while leveraging proven S-PLANE software Component and Application Add-ons to reduce development effort and accelerate implementation. S-PLANE Add-ons range from flight control, navigation, redundancy management, and data logging software, to complete horizontal-integration software to manage subsystems such as sensors, actuators, engines, power distribution units and fuel pumps.

XSIM2-SDK allows S-PLANE and custom-developed software Components and Applications to be integrated, configured, replaced or removed as project requirements evolve. Compatible with S-PLANE's NX-FCU and X-CUBE flight computers, it supports a scalable software architecture that can adapt to changing programme requirements and accommodate migration across processors, operating systems and S-PLANE hardware platforms. This flexibility enables development teams to tailor software configurations to specific project needs while maintaining a consistent, adaptable development environment.

XSIM2-SDK

Run-Time Environment

The Run-Time Environment (RTE) provides the foundation for connecting and executing RTE Components within RTE Applications. These RTE components are fundamentally written in C++ and can be developed using either manual software coding or the Matlab / Simulink Model Based Design (MBD) tool chain. RTE Applications can be deployed on Real-Time Operating Systems (RTOSs) such as PikeOS and real-time-patched Linux, both natively supported by XSIM2-SDK. Support for other RTOS options available upon request.

Simulink Components

The XSIM2-SDK supports Simulink Model-Based Design (MBD) using MathWorks' development tools. A dedicated XSIM2 Toolbox provides models and library functions for functions such as port access, configuration, data handling and logging. Templates and preconfigured settings further simplify the development process, helping developers create software quickly and efficiently.

RTE Applications

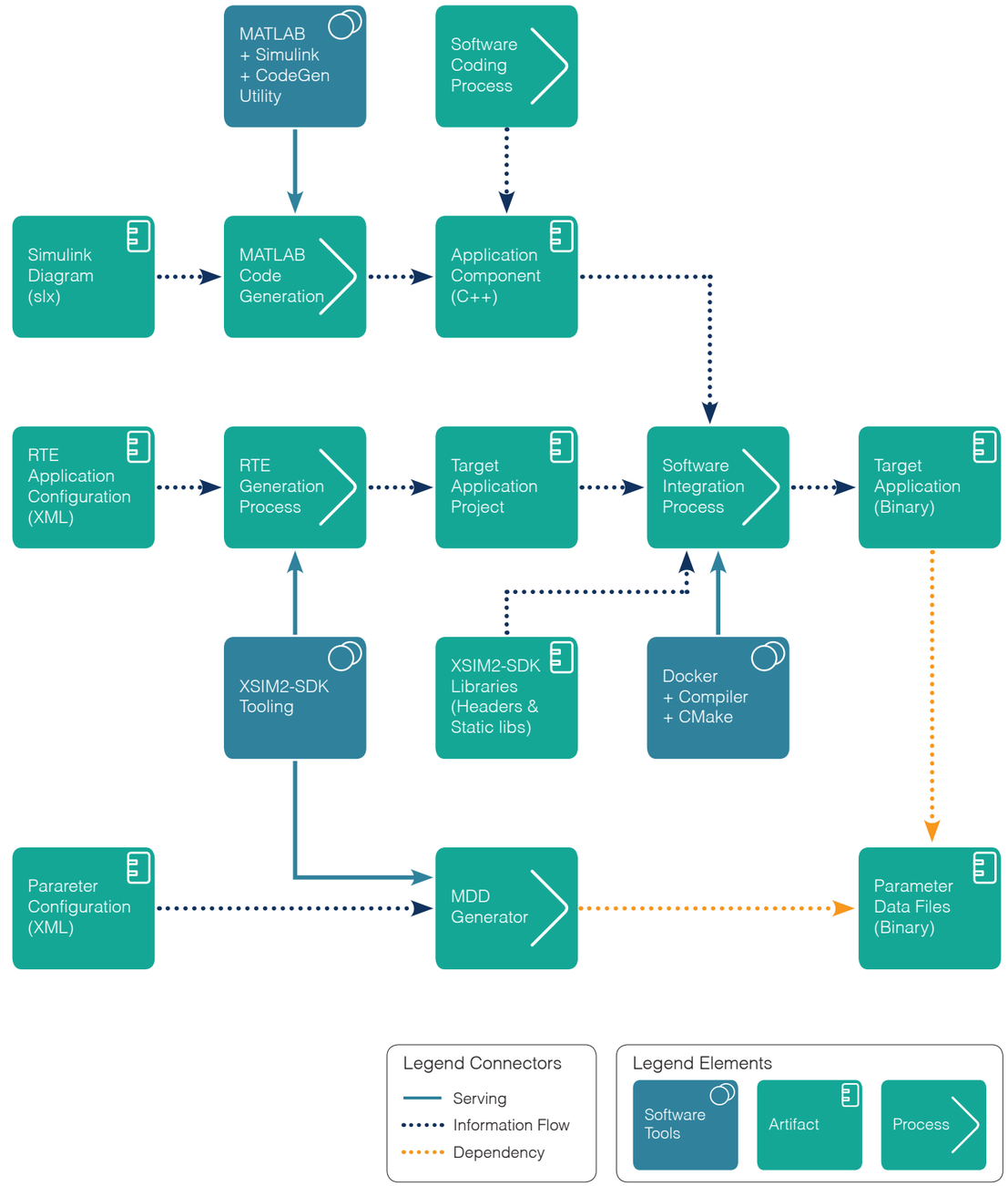
RTE Applications are executable software built from connected RTE Components. An XML configuration file defines how the components are configured and connected, while the RTE Generator converts this configuration into C++ code for building the application. At runtime, the components execute in priority-based threads within the application. while the resultant RTE Applications execute within RTOS partitions with communication via inter-process communication (IPC).

Software Integration

The XSIM2-SDK provides Docker images for a consistent software integration environment and to support Continuous Integration (CI) workflows. CMake manages the RTE build process, with three compilation modes: Compatibility Mode for Windows development, Standard Mode for embedded builds and Certifiable Mode for certifiable embedded builds. Build configuration utilities simplify setup, while Debug and Release options support different development needs.

Software Execution

RTE Applications run as operating system processes, with support for separating workloads across processor cores or partitions. Parameter Data Files can be loaded at start-up, with XML configurations converted into binary files for use by Simulink and C++ applications. Applications communicate through IPC.



X-KIT Key Equipment

X-CUBE

- The X-CUBE is the core avionics unit of the X-KIT for UAS/OPS conversion
- Function: Flight Control Unit (FCU), Power Distribution Unit (PDU) and Input/Output (I/O) Concentrator
- Support SCP, DFR and TFR internal redundancy with dedicated voting
- Further supports dual X-CUBE external redundancy with failover architecture

X-ADT

- Airborne Data Terminal (ADT)
- Function: Mission Computer, I/O Concentrator, HD-SDI Video Encoder, Data Storage, Ethernet Switch
- Supports S-PLANE's mission software and third-party or custom containerised software
- Interfaces with and manages and controls mission payloads (RADAR, EO/IR, SIGINT, AIS and Direction Finder)

X-RPU

- Remote Piloting Unit (RPU)
- Function: Safety-critical Command & Control Computer, and I/O Concentrator
- Interfaces to Primary Flight Controls (PFC), GCC MFD, Hard I/O (buttons and switches with parallel redundancy) and to data links/tracker

TRACKER+

- Stand-alone GNSS-based antenna tracker for UHF, L-, S- and C-bands
- Function: Long-range Line of Sight Communication (LOSCom) between aircraft and Ground Control Stations (GCS)
- Mesh network enabled

GCC and Paragon

- Ground Control Console (GCC)
- Configured as a Remote Piloting Station, Payload Operating Station, or Engineering Station
- Function: HMI for Paragon, PFD with HUD, and MFD (touch display) for Remote Piloting

Equipment Chains & Products

	AIRBORNE CONTROL	GROUND CONTROL	COMMUNICATION	SIMULATION
NX-FCU	Automation & ISR Mission		Automation & ISR Mission	
X-CUBE	Automation		Automation	
X-ADT	ISR Mission		ISR Mission	
X-RPU		Automation		
GCC		Automation & ISR Mission		
Paragon	Automation & ISR Mission			
X-GDT		ISR Mission	Automation & ISR Mission	
TRACKER+			Automation & ISR Mission	
XSIM-HILS				Automation & ISR Mission
XSIM-Workbench				Automation & ISR Mission
XSIM-Video				Automation & ISR Mission

Contact Details: 9B Cyclonite Road, The Interchange, Somerset West, South Africa, 7130 • Phone: +27 21 851 9282, Fax: +27 86 298 4587, Email: info@s-plane.com

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