Protocol Validation System for On-Board Communications

PVS Project Overview

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Presentation Contents

- Project Overview
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- Major Technical Decisions
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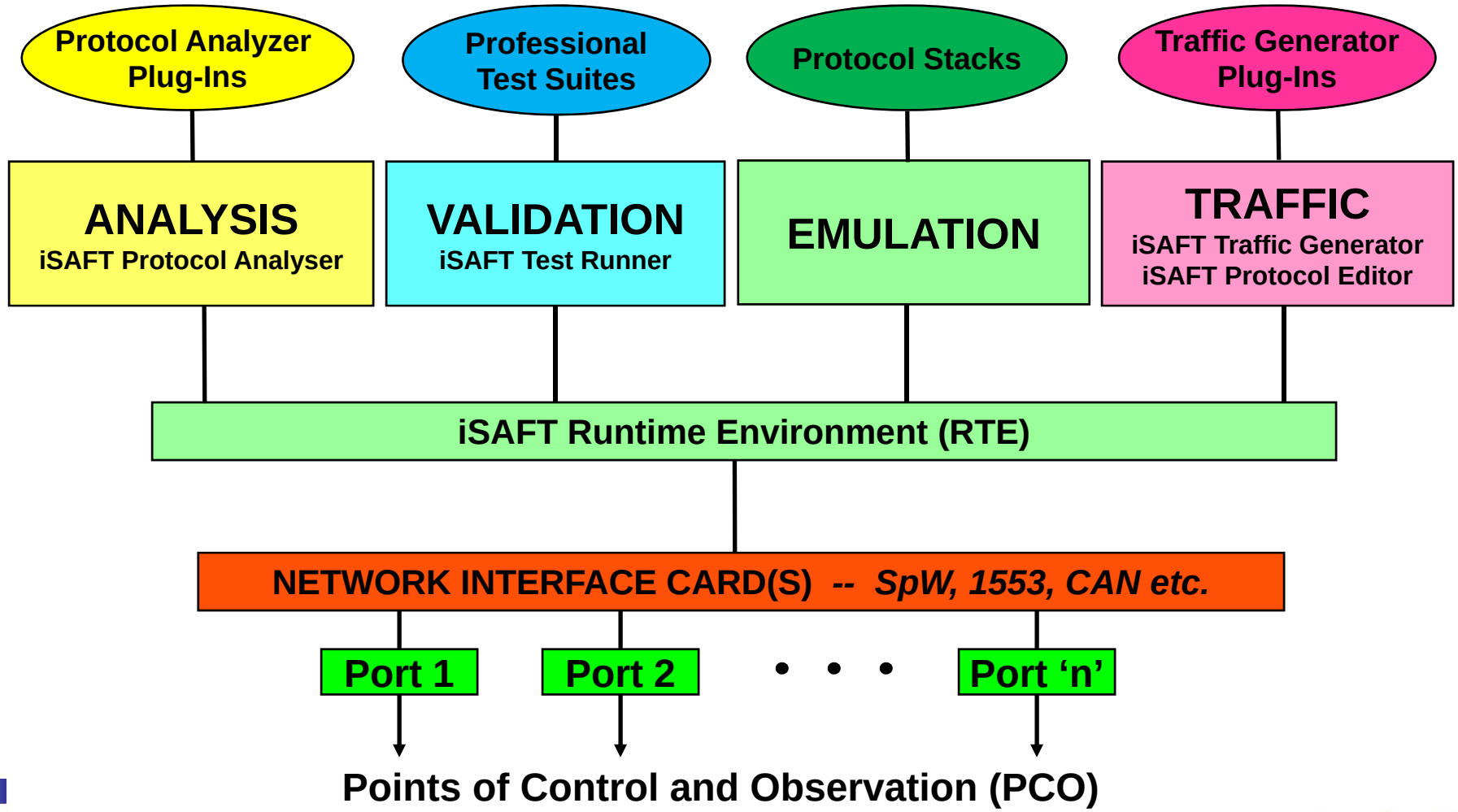
PVS-Phase 2 Project Overview

- Duration
  - Period I: February 2012 – March 2013 (14 months)
  - Period II: April 2013 – July 2014 (16 months)
- Objectives
  - To provide a protocol validation system for the SpW family of protocols (PVS SpW product) – Period I
  - To provide a protocol validation system for the ECSS-E-ST-50-13C (MIL-STD-1553B) protocols (PVS 1553 product) – Period I
  - To provide a protocol validation system for the ECSS-E-ST-50-15C (CANBUS) protocols (PVS CAN product) – Period II
  - To validate the different PVS product instances in four (4) demonstrators – Period II
- Partners
  - TELETEL
  - Astrium SAS (Toulouse, Elancourt)
  - Astrium UK

PVS Overview

- PVS will be a fully integrated protocol validation system for on-board communications supporting a wide range of protocols and physical interfaces
- It will be initially used to analyze and validate SpW, ECSS-E-ST-50-13C (1553), ECSS CAN on-board networks
- It will be easily expandable to support new physical interfaces & protocols
- It will be based on the iSAFT professional tool chain (RTE, Test Runner, Packet Editor, Traffic Generator, Protocol Analyser)

PVS Architecture Overview



PVS Instances (examples)

he PVS shall cover the needs of:

- **Rapid prototyping**
  - *R&D and feasibility studies*
  - *System analysis teams*
- **Functional testing / Interface Simulation**
  - *Device providers*
  - *AIV teams*
- **Interoperability testing**
  - *Device providers*
  - *AIT teams*
- **Stress testing**
  - *All users*
- **Protocol Analysis**
  - *All users*

- Lab Portable System

- Test Station Expander Module

- Site Rackmount System

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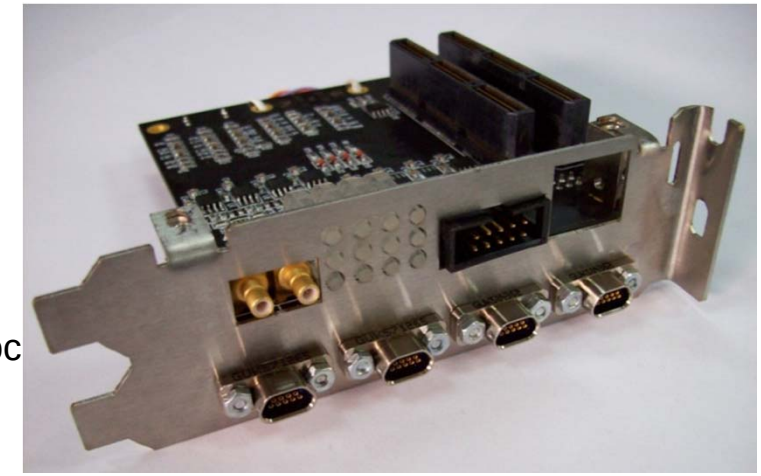
PVS SpW Overview

- **PVS SpW Features:**
  - Full SpW ECSS-E-ST-50-12C compliance
  - Validation Tests according to:
    - SpW conformance tests
    - RMAP conformance tests
    - CCSDS Space Packet conformance tests
  - RMAP, PTP, CCSDS Space Packet protocol emulation
  - Decoding of RMAP, PTP, CCSDS Space Packet protoc messages
  - Traffic Generation Libraries



PVS Quad SpW Interface Card capabilities	
	SpW Links
Link Monitoring	2 Single **OR** 1 Redundant
Protocol Emulation, Traffic Generation, Fault Injection	4 Single **OR** 2 Redundant
Mixed Configuration	2 Single Emulation and 1 Single Monitoring **OR** 1 Redundant Emulation and 1 Single Monitoring

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PVS 1553 Overview

- **PVS 1553 Features**:
  - Validation Tests according to:
    - ECSS-E-ST-50-13C Test Plan for validating BC and RT requirements for ECSS services (*under definition and development*)
    - SAE AS 4111 RT Validation Test Plan supporting Protocol Tests
    - SAE AS 4112 RT Production Test Plan supporting Electrical and Protocol Tests
  - Bus Controller (BC), multiple Remote Terminals (RTs) emulation and Bus Monitoring (BM)
  - BC, RT emulation of ECSS-E-ST-13C services
  - BM supports decoding of 1553 and ECSS messages using Wireshark Network Analyser

PVS MIL-STD-1553B COTS Interface Card capabilities	
2 Independent Dual redundant channels	Full function BC, multiple RTs and BM operation simultaneously in each channel
Bus Controller operation	Major/Minor frame scheduling Aperiodic messages insertion Conditional BC Branching
Remote Terminals operation	Full RT support
Bus Monitoring	IRIG-B, Time Stamping with 100nsec resolution

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PVS CAN Overview

- **PVS CAN Features**:
  - Validation Tests according to:
    - ECSS-E-ST-50-15C conformance tests for validating Time Distribution, Redundancy, LDUT protocol (*under definition and development*)
    - CiA 310 CANOpen conformance tests
  - CANOpen Master / Slave node emulation supporting ECSS-E-ST-50-15C protocol services
  - CAN/CANOpen Traffic Generation
  - CAN/CANOpen Bus Monitoring, decoding on Wireshark Network Analyser, Real Time statistics

PVS CAN Interface Card under development	
4 Physical Interfaces	Support both ISO-11898-2 and RS-485 physical layers with isolation Configurable as 4 single channels or 2 redundant
Host Interface	PCIe
IRIG	IRIG-B digital interface
CAN controller	Developed in FPGA
CANOpen protocol support	Programmable Triggers and Hardware Timers providing **Real Time** support for CANOpen SYNC

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Benefits

- All-in-one validation environment
- Suitable for use in many different areas and by many different users
- Easy integration of new physical interfaces, protocol emulators ,3rd party applications
- Built on open and standard technologies
- Support of multiple networks simultaneously for interworking validation scenarios

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PVS-Phase 2 Project - Status

- The project is completing Month 8
- The Preliminary Design Review was successfully completed
- The following Technical Notes were finalised and approved by ESTEC
  - TN-101: PVS consolidated user requirements and validation plan
  - TN-102: PVS top-level partitioning and demonstrators' architecture design
  - TN-202: PVS SpW product validation and qualification plan
  - TN-302: PVS 1553 product validation and qualification plan
  - TN-201: PVS SpW product design specification (preliminary design)
- A delay of three (3) months has been attributed to the start of the PVS 1553 product design specification activities (new start date September 2012)

PVS-Phase 2 Project – Plan for the Next Period

- The SpW Quad PCIe Network Interface Card will be available in January 2013
- The RMAP, PTP, CCSDS Space Packet test suites, protocol emulators and protocol analyser plug-ins will be available in February 2013
- The PVS SpW product instance will be available in March 2013
- The PVS 1553 product instance detailed design activities are in progress
- The PVS 1553 product instance is expected to be available in April 2013

teletel

- 124 Kifissias Avenue
- 115 26 Athens, Greece

- Tel: +30 210 6983393
- Fax: +30 210 6983391

- email: rtd@teletel.eu
- http://www.teletel.eu