“Accelerated Deployment of SCA-compliant SDR Waveforms”

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Today’s panelists

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Agilent Technologies,
Principal Engineer

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Agenda

Introduction

Achieving a streamlined, verified, SCA-compliant design flow for software-defined radio

- High-level design flow description
- Agilent SystemVue
- PrismTech Spectra CX

Demonstration

Moving forward
SDR Waveform Development

Problem statement

Inefficient previous-generation design practices and platforms

– Conservative architectures, excess margin
– Manual integration, disjointed flow
– SCA complexity

Coping with external pressures

– Complexity of emerging COTS waveforms
– Rapid evolution of both Threats and Standards
Accelerating SCA-compliant waveform design

PrismTech and Agilent have teamed together to create a connected design flow for Software-Defined Radio

- Streamlines the design process
- Quickly creates “measurement-hardened” radio components, verified early against RF & IP references, and then Test Eq.
- Accelerates deployment of SCA-compliant waveforms

Result: Best-in-category vendors, with modern environments, focused on a solution for SDR
Rapid Prototyping Concept

Two leading environments, each focused on its specialty

**Key new contributions:**

- Environments mutually enhanced to smooth the SDR design flow
- Innovative new “return path” for verification & continuous evolution
New system-level design environment from Agilent

Provides top-down ESL cockpit for comms/defense design

Unites Baseband with Agilent leadership in RF, Test, and Communications IP

Ideal for model-based design across “A/D Converter Divide”
Convenient, polymorphic algorithm modeling and debugging model-based design using native math lang., C++, GUI & co-sim against H/W

Superior RF models and simulators unites RF & Baseband approaches, reduces excess design margins for both

“Golden reference” IP libraries bring Agilent-grade wireless knowledge into the inside of your algorithms & systems

Path to rapid prototyping C++ and VHDL Code Generation paths to your existing design flow infrastructure

Built for easy verification links to Test Equipment and HDL co-simulation allow easy, scriptable test vectors and verification of both the block-level and link-level

Attractive configurations for workgroups
SystemVue Polymorphic Model-Based Design

SystemVue Models

Fixed Point / Floating Point Models

- MathLang Or Matlab (cosim)
- VHDL
- Verilog
- C++

Code Generation

- Floating Point Model Export
  * Excludes MathLang models
- Fixed Point Model Export
  * Excludes MathLang models

Implementations

- Your Math .m
- Your HDL
- Your Code
- C++
- HDL

Code Generation

Agilent Technologies
Any node in the signal processing path can be accessed for post-processing, ASCII output, or scripting.

Polymorphism makes direct comparison of test vectors easy.

Environment and simulators are all easily scriptable.

Single-step math or C++ algorithms in debug while RF, Test Equipment, and VHDL co-simulations are running, to aid in troubleshooting.
Product Info: Spectra CX 3.2
SCA component packaging & deployment

Spectra CX provides radio developers with an SCA specific software development environment

Supports model-driven architecture and development (MDA/MDD) of SCA Waveforms and Platforms

Applications are designed in accordance with the SCA architecture

Generates “correct by construction” XML Descriptors and SCA structural code (C++, C, VHDL)

Integrates with industry standard design tools to provide support for the Waveform and Platform development lifecycle:

Architect → Model → Validate → Generate → Develop → Build → Deploy → Test
Spectra CX & OE

End-to-end solution: Model, generate, validate, deploy

Spectra CX: Model-Based Development Tool

- Eclipse Workbench
- UML 2
- Windows / Linux / Unix

Spectra CX:
Model-Based Development Tool

Radio Application (Waveform)
SCA Infrastructure

Spectra OE: Core Framework

Spectra OE: e*ORB

Radio Application (Waveform)
SCA Infrastructure

TCP/IP v4/v6

SCA 2.2.2 and POSIX AEP
RTOS / Linux
ASP
BSP
Hardware (GPP, DSP, FPGA)
How do the tools work together?

- Design and Test Waveform Functionality in SystemVue
- Import for implementation using Spectra CX
- Complete SCA Component Design
- Generate and Build SCA Waveform
- Deploy/Test Waveform on SCA Platform

- SystemVue
- Spectra CX
- Spectra CX + SystemVue
1: Design, Simulate, Test Functionality

Design and Simulate With SystemVue
2: Move Functional Components into SCA Application

Design and Simulate With SystemVue

Import into Spectra to create SCA compliant Components and Applications
3: Deploy Application on a SCA Platform

Design and Simulate With SystemVue

Import into Spectra to create SCA compliant Components and Applications

Deploy your application on a SCA platform (Spectra OE)
4: Link Application to Simulation and Test

Design and Simulate With SystemVue

Import into Spectra to create SCA compliant Components and Applications

Link your running application to Simulation and Test

Deploy your application on a SCA platform (Spectra OE)
DEMONSTRATION
Summary: Improved Approach for Waveform Application Development-to-Test

- Design and Simulate With SystemVue
  - Import into Spectra to create SCA compliant Components and Applications
- Link your running application to Simulation and Test
- Deploy your application on a SCA platform (Spectra OE)
Key elements demonstrated

**SystemVue:**
- Quickly developed layer 1 waveform algorithms
- Verified against RF effects, Reference IP, and even Test Equip.
- Exported a design format that Spectra CX could easily import
- Brought everything back together in the end

**Spectra CX**
- Quickly packaged the waveform components
- Deployed an efficient OE that is SCA-compliant
- Streamlines many steps that were previously manual
Innovative element:
“Operating Environment (OE) In The Loop”

SystemVue

Spectra OE

CORBA
Innovative element: ...
or “Simulation in the Waveform Application”

SystemVue

Spectra OE
Why “OE In the Loop”

• Add RF simulation to waveform applications running on the platforms
• Add bit-accurate simulation of implementations before converting them to full-blown SCA components
• Parallel comparison of SCA component with simulated component.
• Add test points to operational waveforms, bring samples of data out to simulation and measurement (e.g. VSA)
Connected, virtualized tools accelerates SDR waveform maturity, robustness

**For Spectra CX users:** SystemVue unlocks Comms, RF, and Test Equip knowledge

**For SystemVue users:** Spectra CX unlocks SCA and modern software techniques
Beyond simulation:

**Test Hardware with “OE In the Simulation Loop”**

- SystemVue allows RF & Test to be virtualized, and brought directly into the algorithm environment
- Start bringing deployed hardware and real waveforms back into your development suite

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**Diagram Description**:

- **Download Simulated Signal with RF Impairments**
- **Capture DUT Signal and Read into SystemVue**

**Block Diagram**:

- **QPSK Transmitter (OE-in-the-loop)**
- **QPSK Receiver (OE-in-the-loop)**

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**Diagram Credit**: Agilent Technologies
Commercial availability

PrismTech Spectra CX

- Requires version 3.2 available end of March 2010

Agilent SystemVue

- Requires release 2010.01 (or later) with W1718 C++ Code Generator
- Initial integration available by invitation, March 2010
- More automated integration expected Summer 2010

• Streamlined
• Verified
• SCA-compliant
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THANK YOU

For more information
www.agilent.com/find/systemvue
www.agilent.com/find/SCA (*including video demonstration*)
www.prismtech.com/spectra

Or, contact your regional PrismTech or Agilent resource
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