Integrating AADL-based Tool Chain into Existing Industrial Processes

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Adoption of AFDX - Challenges

- Analysis of AFDX network configurations
 - Flow latency
 - Size of buffers
 - Fault analysis
- Generation of configurations for AFDX switches and end systems

Virtualization of Network

Avionics Full-Duplex Switched Ethernet



Adoption of AFDX - Challenges

- Analysis of AFDX network configurations
 - Flow latency
 - Size of buffers
 - Fault analysis
- Generation of configurations for AFDX switches and end systems
- What is else?





Adoption of AFDX - Challenges

- Analysis of AFDX networks
 - Flow latency
 - Size of buffers
- Generation of configurations for AFDX switches and end systems
- Unification of architecture models
 - Unified data source for analysis tools
 - Improved traceability between documents



ICD DB

- is a data source for test stand configuration and management
- contains network-centered model of system
 - buses and messages/signals
 - hardware components
 - software partitions
- supports process workflow
 - configuration management
 - branch management
 - access rights management

ICD DB (2)

Extend ICD DB

- Add attributes of AFDX networks, ARINC-653 partitions, hardware components
- Develop required tools on top of it
- and enjoy AFDX tools and unified model

ICD DB (2)

Extend ICD DB

- Add attributes of AFDX networks, ARINC-653 partitions, hardware components
- Develop required tools on top of it and enjoy AFDX tools and unified model
- Or use one of standardized architecture descrption languages
 - AADL
 - MARTE
 - SysML

AADL vs. SysML

	AADL	SysML
Formal semantics	+	_
Real world modeling	-	+
Requirements traceability	±	+
Avionic specific features	+	—
Textual representation	+	_
Commercial tool support	±	+
Open source tool support	+	+



Our Needs

AADL IDE

- AADL textual&graphical editor
- AADL parser&semantic checker
- AADL model
- Analysis and generation tools integration
- Transformation AADL to other models
- System Design Process Integration

AADL Open Source Tools

- OSATE Eclipse-based IDE
- ADELE Eclipse-based graphical editor
- OCARINA transformation tools
 - Emacs&vi
 - Dia

OSATE as AADL IDE

OSATE is a great Eclipse-based IDE except for

- Textual AADL representation is a second class citizen
- Too highly coupled
- Some stability issues
- AADLv2 not yet supported

System Design Process Integration

- Configuration Management
 - Baseline, etc.
 - Change Requests associated with modifications in an architecture model
- Branch Management
 - Modifications of aircraft
 - Several variants to be analyzed simultaneously
- Access Rights Management
 - Restriction of modification rights
 - Subcontractors
- Traceability
- Tools Qualification

System Design Process Integration

	AADL	File- grained SCM	Fine- grained SCM
Configuration management	N / A	+	+
Branch management	±	±	+
Access rights management	N / A	±	+
Tools qualification	N / A	±	_



MASIW Architecture



MASIW Pluggable Components

- Scheduling algorithms
 - Early Deadline First
 - Rate Monotonic
 - Custom limitations
- CPM configuration generators
 - ARINC-653
 - WindRiver VxWorks-653
- Validation and analysis tools
 - AFDX network simulator
 - AFDX configuration generator

Pilot Project Results

- AADL is an appropriate platform for unification of architecture models
- Open source tools for AADL have limited flexibility
- Integration into existing development process
 - Configuration management
 - Branch management
 - Access rights management
 - Traceability
 - Qualification

Future Works

- Support for AADLv2 and ARINC-653 annex
- Graphical editor
- Integration with open-source tools such as OCARINA, CHEDDAR, MAST, REAL, AADL2Fiacre, OSATE checks
- Support for requirements traceability
- More flexible AFDX simulation
- Multi-level AADL models

Thank you!

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