



# SystemWeaver for EAST-ADL

## **Concept Presentation**

2013







## Concept presentation roadmap

#### 1. Short description

- O Systemweaver is
  - a generic system modeling platform almost every need of general system modeling is met in the SystemWeaver platform
  - O a collaborative environment support for versioning and traceability

#### 2. EAST-ADL Support

- The complete meta-model is implemented in Systemweaver
- Tree, graph, allocation, Table and list view are available
- C# API, report and document are available
- O RIF export
- Special requirement view

#### 3. Systemweaver concept

#### 4. File Exchange

 File exchange between Systemweaver and EAXML is realized through model transformation

#### 5. Simulink Integration

• Integration between SystemWeaver and Simulink is available





### 1. SystemWeaver - A collaborative environment

-Users can easily collaborate their work.

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- 2. Systemweaver EAST-ADL Support
  - Complete tree based EAST-ADL implementation
  - Graph view
    - OFeature Model, HDA, FDA, FAA and ErrorModel
  - Tree View
    - Systemwaever is basically a tree based modeling platform. The complete tree based EAST-ADL implementation is available in Systemweaver.
  - Allocation View

OA speecial view for allocation is implemented





## **Feature Model**





## Special requirements view

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# **RIF** export

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SystemWeaver Concept Presentation



## Tree view: enables prototype view

 Example: when selecting the "Braking\_DependabilityModel" : You also get info for all prototypes (Systemweaver parts) on the right hand side.

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Welcome Dashboard Items Projects				
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	1 IFEVSystem_FunctionEr	rrorModel ErrorModelTy rrorModel ErrorModelTy	pe FEVSystem_FunctionErrorModel pe FEVSystem TechnicalErrorModel	(1) Work (1) Work
	4 ABSBrakingActuator	ErrorModelTy	pe ABSBrakingActuator	(1) Work
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# MAENAD

## **FDA** View







## FAA view



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**FDA/FAA** Allocation







# HDA/FDA Allocation



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# Dependability

## Dependability is implemented in Systemweaver

The instance refs are implemented using allocation

## OExample: the instance ref between constrainedFaultfailure and the anomaly is realized through allocation in SystemWeaver.

# MAENAD



## **Realizing InstanceRef through Allocation**

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# C# API, Document and Report support

 In SystemWeaver, Document is used to export model information in a readable way using:

O Table, graph, list, matrix etc

 Report is used to perform consistency checks on a model or design.

O Example: Requirement, and signals consistency check

 C# API – is used for consistency check, generating information, integrating with different tools etc





# Example: document table

#### 1.2.2 PowerElectronic

#### 1.2.2.1 Ports

Name	LastChanged	PortDirectio n
PHPHVBIn	2012-06-20	in
PHPOutSS	2012-06-20	out
PHPRSOut	2012-06-20	out

#### 1.2.3 ElectricVehicleController

#### 1.2.3.1 Ports

Name	LastChanged	PortDirectio
		n
CHPEvaluateInterlock	2012-06-20	in
FeedInterlock	2012-06-20	out
PowerSourceEnabled	2012-05-29	out
PowerSourceEnabled	2012-05-29	out





## 3. Systemweaver Concepts

Motivation of the SystemWeaver concepts:

- Effective modeling abilities: Every model structure is defined in a specific context, creating hierarchical prototype/type structures
- Strong meta model: Impossible to add relations to a component which are not provided by the meta-model.
- Documentation on model and meta model is available by just a "click"
- Portconcept & graphical support





### Motivation of the SystemWeaver concepts:

- Fine grained versioning every item has its own versioning
- Specific and self-sufficient contexts/building blocks





## Every item has its own versioning

- Every of these versions form a separate configuration
- This is useful for old projects

差 SystemModel - Default(modified)	💷 Overvie	<b>∧</b> •	GlobalBra	keController			I	DesignFunctionType
Name	Last Changed	Last Changed By	Creation Date	Access	Owner	Status	Version	
🕞 💒 BBW_4Wheel	2012-10-17	Nigsti	2012-09-21	Read Only	Nigsti	Released	(1)	
🕀 🍟 BBW_VL	Attributes							*
⊕ BBW_AL	Default							
🖶 🔤 BBW_DL	Derduit	-				7		
🖨 🔚 BBW_FDA		category						
🚊 🖬 🗊 GlobalBrakeController		isElementary	<b>*</b>					
🖶 🔂 ABSFrontLeft		name				7		
😥 🔂 ABSRearRight	Description 1							
⊕ 🗗 ABSFrontRight	Descriptio	n						^
⊕ 🔂 ABSRearLeft								*
BBW_HDA								
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⊞ BBW_Pow								
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# Specific and self-sufficient building blocks/contexts

- Every relation is defined within a specific context: the item that owns the relation (i.e. owns not just its prototypes, but all the relations between prototypes). No relation can exist without a defined context.
- Prototype/Type pattern is used for <u>all instances in SystemWeaver models.</u>



FUCAR

![](_page_21_Picture_0.jpeg)

![](_page_21_Picture_1.jpeg)

# Every relation is defined within a specific context:

![](_page_21_Figure_3.jpeg)

![](_page_22_Picture_0.jpeg)

## Motivation: Strong meta model

 Strong meta model: impossible to cross the meta-model rules.

FUCAR

SEVENTH FRAMEWORK

- This can increase the correctness of the model.
- Only the possible relations are listed
- Example: LH Window Lift Control – is an EA AnalysFunctionType

![](_page_22_Picture_6.jpeg)

![](_page_23_Picture_0.jpeg)

MAEN/ND Documentation by "click" – Inheritance information

![](_page_23_Figure_2.jpeg)

![](_page_24_Picture_0.jpeg)

![](_page_24_Picture_1.jpeg)

# Documentation by "click" – Model information

- Possible to display the object information by pressing alt and select the interesting object.
  - Example; the Missed standstill object is slected: then model information appears on the right side.

![](_page_24_Figure_5.jpeg)

![](_page_25_Picture_0.jpeg)

## Documentation by "click" - Meta model

- It is also possible to display the EAST-ADL meta-model description of the type by using alt + shift + click on the interesting Item, in this example "My Vehicle level"
- This can be useful for new users and also for cross checking the type

![](_page_25_Figure_4.jpeg)

SEVENTH FRAMEWORK

![](_page_26_Picture_0.jpeg)

![](_page_26_Picture_1.jpeg)

## 3. Portconcept & graphical support

#### EAST-ADL

 FunctionFlowPort has the attribut "direction" which decides the direction of the FlowPort.

<u>SystemWeaver</u>

- Classical approach is that the portdirection is decided when the port is created ("part" in systemweaver)— and you cannot change direction on ports after the prototypes (parts in SystemWeaver) are created
  - Reason 1: No need for consistence control of port directions; changing direction means that the port must first be removed, in turn meaning that all connections must also be removed (external assembly, internal delegation)
  - Reason 2: Especially in large projects it is alway problematic when ambiguous ports occur
- Current graph implementation where the attribute solution is used does not indicate direction, since a basic in/out construct is used for all port types.

![](_page_27_Picture_0.jpeg)

![](_page_27_Figure_1.jpeg)

![](_page_27_Figure_2.jpeg)

![](_page_28_Picture_0.jpeg)

![](_page_28_Picture_1.jpeg)

#### Current implemention follows EAST-ADL concept:

Hy work area(1)	🔁 My Design Level(1)	+□+ Window lift buttons(1)	🔄 Libraries
😂 WorkArea	🥌 Attributes 🔹		Window Lift Control
Name 🔀 My work area 🗲 My System Model	Item Attributes		
My Vehicle level	Part Attributes		
⊡··· →⊡→ LH Window Lift Control	rpPortPrototype	care a d	
···· · Motor control ···· · · · · · · · · · · · · · · · · ·	Motor control	out *	
Motor current	Motor current	inout 👻	
Window lift	Motor control	· · · · · · · · · · · · · · · · · · ·	
⊕··· →□→ RH Window Lift Control ⊕··· →□→ RH Window Lift			
⊕ → C+ Window lift buttons			

![](_page_29_Picture_0.jpeg)

![](_page_29_Picture_1.jpeg)

#### System Weaver Graph Editor visualizing

![](_page_29_Figure_3.jpeg)

![](_page_30_Picture_0.jpeg)

![](_page_30_Picture_1.jpeg)

## 4 File exchange

- According to the research approch used, ATL is proved to be the suitable model transformation language for SW, EAXML integration.
- EMF is used to generate the EAST-ADL and Systemweaver ecore based metamodels
- A stand alone java application is implemented to hide the ATL configuration complexity
- Import and export for SystemModel is available. This includes Feature model, Analysis Function, Design Function and Hardware component. An export for Dependability is also available.

![](_page_31_Picture_0.jpeg)

![](_page_31_Picture_1.jpeg)

# Research approach used

![](_page_31_Figure_3.jpeg)

SystemWeaver Concept Presentation

![](_page_32_Picture_0.jpeg)

![](_page_32_Picture_1.jpeg)

## General overview of ATL transformation

## Example: SystemWeaver2EAXML

![](_page_32_Figure_4.jpeg)

![](_page_33_Picture_0.jpeg)

![](_page_33_Picture_1.jpeg)

### Example: SystemWeaver to EAXML transformation

![](_page_33_Figure_3.jpeg)

![](_page_34_Picture_0.jpeg)

![](_page_34_Picture_1.jpeg)

# Example of generated model files

```
<?xml version="1.0" encoding="ISO-8859-1"?>
<xmi:XMI xmi:version="2.0" xmlns:xmi="http://www.omg.org/XMI" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xmlns:XML="XML">
  <XML:Root name="EAXML">
   <children xsi:type="XML:Attribute" name="xmlns" value="http://autosar.org/3.1.4"/>
    <children xsi:type="XML:Attribute" name="xmlns:xsi" value="http://www.w3.org/2001/XMLSchema-instance"/>
    <children xsi:type="XML:Attribute" name="xsi:schemaLocation" value="http://autosar.org/3.1.4 file:EAST-ADL_100630.xsd"/>
    <children xsi:type="XML:Element" name="TOP-LEVEL-PACKAGES">
      <children xsi:type="XML:Element" name="EA-PACKAGE">
        <children xsi:type="XML:Element" name="SHORT-NAME">
          <children xsi:type="XML:Text" name="#
                                                     <?xml version = '1.0' encoding = 'ISO-8859-1' ?>
        </children>
                                                   ⊖ <SystemWeaver4>
        <children xsi:type="XML:Element" name="
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          <children xsi:type="XML:Element" name
                                                         <Item id="x0400000000164DF" sid="EAHC" ancestor="x0400000000164DF">
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                                                           <Name>HardwareEVDemo</Name>
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            </children>
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              <children xsi:type="XML:Element"
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                                                                    <DefObj id="x04000000001655A"/>
              </children>
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            </children>
                                                                  <Part ancestor="x0400000001655F1" id="x0400000001655F1">
            <children xsi:type="XML:Element" na
                                                                    <Name>BrakePedal</Name>
              <children xsi:type="XML:Element"
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                <children xsi:type="XML:Element
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                  <children xsi:type="XML:Text"
                                                                    <Name>AcceleratorPedal</Name>
                </children>
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                  <children xsi:type="XML:Eleme
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                      <children xsi:type="XML:T
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                    </children>
                                                                    <Name>Motor</Name>
                  </children>
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                </children>
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                                                                    <Def0bj id="x0400000000164E3"/>
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SystemWeaver Concept Presentation

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			Generate Model
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			Check Model Consistency
			Open Simulink Model
			More Functions
«			
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![](_page_36_Picture_0.jpeg)

![](_page_36_Picture_1.jpeg)

# Generated BBW\_FDA

![](_page_36_Figure_3.jpeg)

![](_page_37_Picture_0.jpeg)

# Report generated- including SW and Simulink components

MAEN/\D

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