Patching the gap in collaborating on models

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Who are we?

Ábel Hegedüs

Olivier Constant

this guy could not come :'(

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(IncQueryLabs)

(Corporate Engineering)
In a nutshell...

**Model Patch = patches for models 😊**

- A new component of the EMF Diff/Merge project
- [https://wiki.eclipse.org/EMF_DiffMerge/Model_Patch](https://wiki.eclipse.org/EMF_DiffMerge/Model_Patch)
Why?
Increasing complexity → MBSE mandatory →

Thales
Model-Based System Engineering @Thales with Capella

Complete system description

System description

« Core viewpoints »

Coupled viewpoints

Decoupled viewpoints

Upstream Engineering Workbench

Transition bridge

Operational Analysis viewpoint

System Analysis viewpoint

Logical Architecture viewpoint

Physical Architecture viewpoint

EPBS viewpoint

Capella

Downstream Engineering Workbench

Transition bridge

Code Generation

Operational viewpoint

Perfo. viewpoint

Safety viewpoint

Cost viewpoint

Bridge

Bridge

Safety Engineering

Perfo. Engineering

(e.g., UML, DSLs, etc.)
Consequence: Needs for model synchronization

Complete system description

System description

« Core viewpoints »

Coupled viewpoints

Decoupled viewpoints

Model merging & synchronization

Upstream Engineering Workbench

Transition bridge

Operational Analysis viewpoint

System Analysis viewpoint

Logical Architecture viewpoint

Physical Architecture viewpoint

EPBS viewpoint

Operational Engineering

Perfo. Engineering

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Safety Engineering

Cost viewpoint

Perfo. Engineering

Transition bridge

Downstream Engineering Workbench

(e.g., UML, DSLs, etc.)

Code Generation
Collaboration on models @Thales

Versioning ≠ Multi-user support

Team for Capella

VCS
(ClearCase, SVN, Git)

Shared model

V1.0

V2.0
Collaboration on models @Thales

Consequence: Coarse-grained branches

VCS
(ClearCase, SVN, Git)

... but reporting changes by merge is still needed
Collaboration on models @Thales

Reuse: Happens outside version control & formal workflows
Model Patches in the picture: Why?

- Model synchro is everywhere
  - Engineering process: multi-viewpoint, multi-environment, multi-level
  - Classical version control
  - Opportunistic reuse

- Need for more flexibility for the end-users
  - Do not require the source and target models to be available at the same time
  - Decouple the diff computation time from the diff application (merge) time
  - Reuse the same update decisions in different contexts
Model Patches in the picture: Why?

Hence Model Patches

Some usage scenarios are clearly identified
... but most remain to be discovered

- A technological enabler → relevance in OSS
Model Patches in the landscape

- Related work
  - EMF Notifications & Change model
  - CDO deltas
  - EMF Compare
  - EMF Diff/Merge

- Past abandoned attempts
  - Mpatch / Epatch

- Now clear industrial needs
What?

(AT LAST, THE FUN STUFF)
Live Demo
Model modified in repository
Workflow: Patch recording from difference

Model -> EMF Diff/Merge -> Modified Model

EMF Diff/Merge -> Diff

Diff -> Patch Recorder

Patch Recorder --> persist

Model

Modified Model

Diff

Patch Recorder

Target

compare

read
Compare with previous revision and generate patch
Model patch viewer

Sequence of patch entries:

Add '7fdbbeb5-db7e-405b-a981-5b17262f43ea' (type: 'http://www.polarsys.org/capella/core/ctx/1.1.0#SystemFunction')
Add 'ba44b93f-5314-4510-9ceb-4732f3cd8f70' (type: 'http://www.polarsys.org/capella/core/fa/1.1.0#FunctionalExchange')
Add '330cc398-1c4a-4d9d-b85e-b0a6617d4551' (type: 'http://www.polarsys.org/capella/core/fa/1.1.0#FunctionOutputPort')
Add '55c1a354-2a3e-4439-8e4b-0e01ea06b936' (type: 'http://www.polarsys.org/capella/core/fa/1.1.0#FunctionInputPort')
Add reference to '7fdbbeb5-db7e-405b-a981-5b17262f43ea' to the 'http://www.polarsys.org/capella/core/fa/1.1.0#AbstractFunction.ownedFunctions' list of '411a501a-
Add reference to 'ba44b93f-5314-4510-9ceb-4732f3cd8f70' to the 'http://www.polarsys.org/capella/core/fa/1.1.0#AbstractFunction.ownedFunctionalExchanges' list of '411a501a-
Add reference to '55c1a354-2a3e-4439-8e4b-0e01ea06b936' to the 'http://www.polarsys.org/capella/common/activity/1.1.0#AbstractAction.inputs' list of 'ff70c856-f66-
Add reference to '330cc398-1c4a-4d9d-b85e-b0a6617d4551' to the 'http://www.polarsys.org/capella/common/activity/1.1.0#AbstractAction.outputs' list of '7fdbbeb5-
Set 'http://www.polarsys.org/capella/common/activity/1.1.0#ActivityEdge.target' reference of 'ba44b93f-5314-4510-9ceb-4732f3cd8f70' to '55c1a354-2a3e-4439-8e4b-
Set 'http://www.polarsys.org/capella/common/activity/1.1.0#ActivityEdge.source' reference of 'ba44b93f-5314-4510-9ceb-4732f3cd8f70' to '330cc398-1c4a-4d9d-b85e-
Set 'http://www.polarsys.org/capella/common/core/1.1.0#AbstractNamedElement.name' attribute of '7fdbbeb5-db7e-405b-a981-5b17262f43ea' to 'Setup Test Harness'
Set 'http://www.polarsys.org/capella/common/core/1.1.0#AbstractNamedElement.name' attribute of 'ba44b93f-5314-4510-9ceb-4732f3cd8f70' to 'Launch Tests'
Set 'http://www.polarsys.org/capella/common/core/1.1.0#AbstractNamedElement.name' attribute of '330cc398-1c4a-4d9d-b85e-b0a6617d4551' to 'FOP 1'
Apply patch
Workflow: Patch apply and compare
Compare In-Flight Entertainment System.melodymodeller Current and 89ada74

Synthesis

- Root System Function (4)
  - Perform Maintenance, Configuration and Test Operations (1)
  - Launch and Analyze Tests (1)
- FIP 1
  - Setup Test Harness (1)
    - FOP 1
    - Launch Tests
- Actors (1)
- Ground Operator (1)
  [Component Functional Allocation] to Setup Test Harness

Details of the System Function

/ife_supplier/In-Flight Entertainment System.

- Audio Video Broadcast Commands
- Imposed Video Control Commands
- VOD Movie Control Commands
- Root System Function
  - Perform Maintenance, Configuration
    - Update Media Content
    - Configure the System
    - Launch and Analyze Tests
    - Set Passenger Service Authorization
  - Setup Test Harness
    [Function Realization] to Root Operator

Compare after merge
Reverse changes

You can select changes which you want to apply. The target model will be only modified if you explicitly merge changes from the synthesis panel.

**Synthesis**
- In-Flight Entertainment System (2)
  - System Analysis (2)
  - System Context (1)
    - **Ground Operator : Ground Oper**
  - Actors (1)
    - **Ground Operator (1)**

**Resolved Model**
- System Context
  - IFE System : IFE System
  - Passenger : Passenger
  - Cabin Crew : Cabin Crew
  - Aircraft : Aircraft
  - Ground Operator : Ground Operation

**Details of the Part**
- Name
  - "Ground Operator"

"Ground Operation Manager"
Model patch representation

ModelPatch

.Entry (change type: ADD, REMOVE)

- Identifiable (identifier)
- ReferenceEntry
- AttributeEntry (value)
- ElementEntry
- FeatureEntry

- Context
- type
- target
- feature
Filter changes
EMF persistence

```
1{
  "metadata": {
    "CLASSNAME": "org.eclipse.emf.ecore.EMFModel",
    "INSTANCE": {
      "createdAt": "2023-01-01 12:00:00"
    }
  },
  "entries": [
    {
      "CLASSNAME": "org.eclipse.emf.ecore.EMFModel",
      "INSTANCE": {"type": {"identifier": "_CGYdUFYDEeeAHP4k8mOZbg"}}
    },
    {
      "CLASSNAME": "org.eclipse.emf.ecore.EMFModel",
      "INSTANCE": {"type": {"identifier": "_CGZrcVYDEeeAHP4k8mOZbg"}}
    },
    {
      "CLASSNAME": "org.eclipse.emf.ecore.EMFModel",
      "INSTANCE": {"type": {"identifier": "_CGZrc1YDEeeAHP4k8mOZbg"}}
    },
    {
      "CLASSNAME": "org.eclipse.emf.ecore.EMFModel",
      "INSTANCE": {"type": {"identifier": "_CGZrdFYDEeeAHP4k8mOZbg"}}
    },
    {
      "CLASSNAME": "org.eclipse.emf.ecore.EMFModel",
      "INSTANCE": {"type": {"identifier": "_CGZrcFYDEeeAHP4k8mOZbg"}}
    }
  ]
}
```
Merge patches as models
Evaluate the Sessions

Sign in and vote at eclipsecon.org

-1  0  +1
Questions?

Still alive?

Examples:
https://github.com/IncQueryLabs/ecf2017

http://www.incquerylabs.com/
@IncQueryLabs

http://www.thalesgroup.com/