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Complex Generations with EGF

EGF
Eclipse Generation Factories

Benoît Langlois / Thales Global Services

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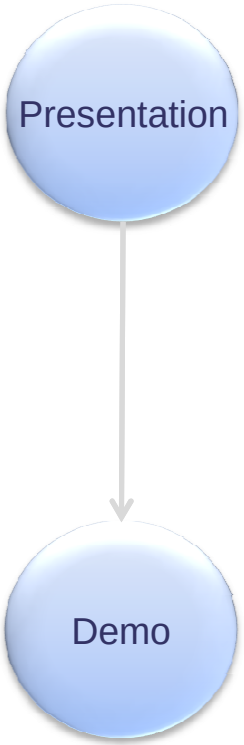
Agenda



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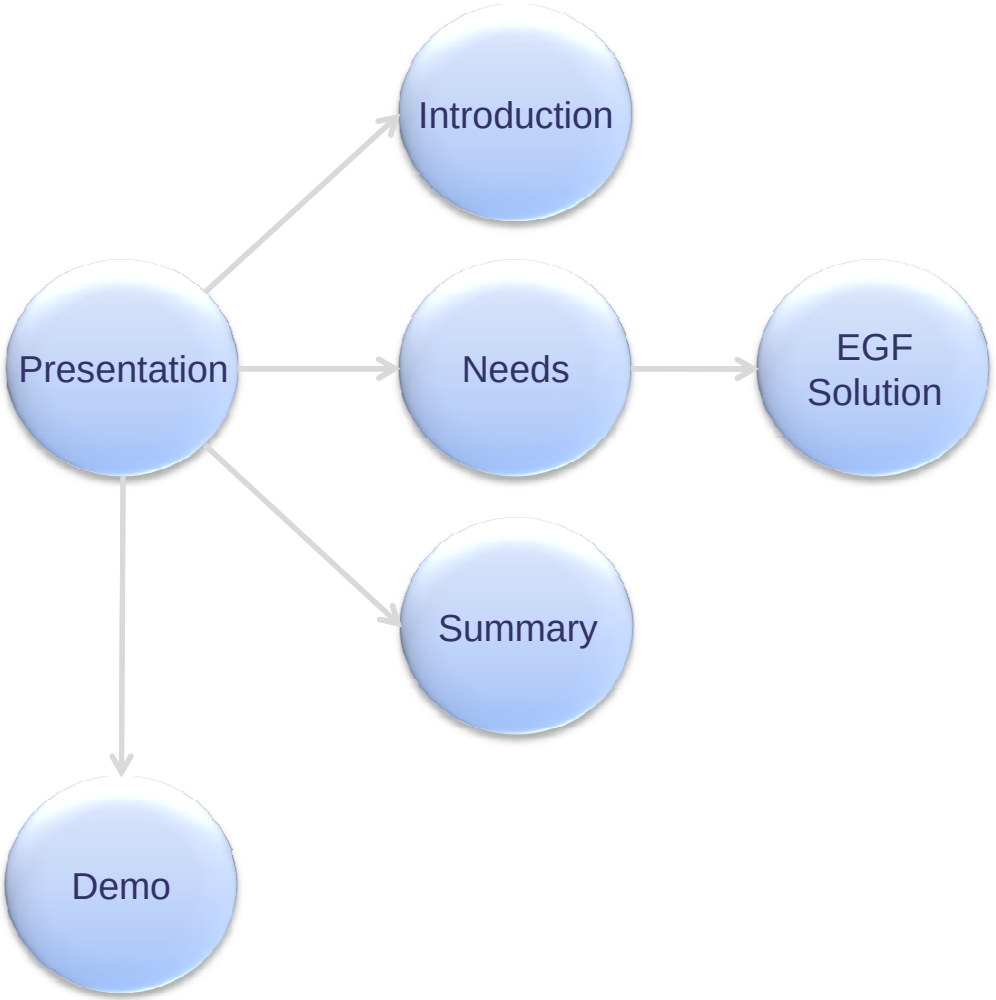
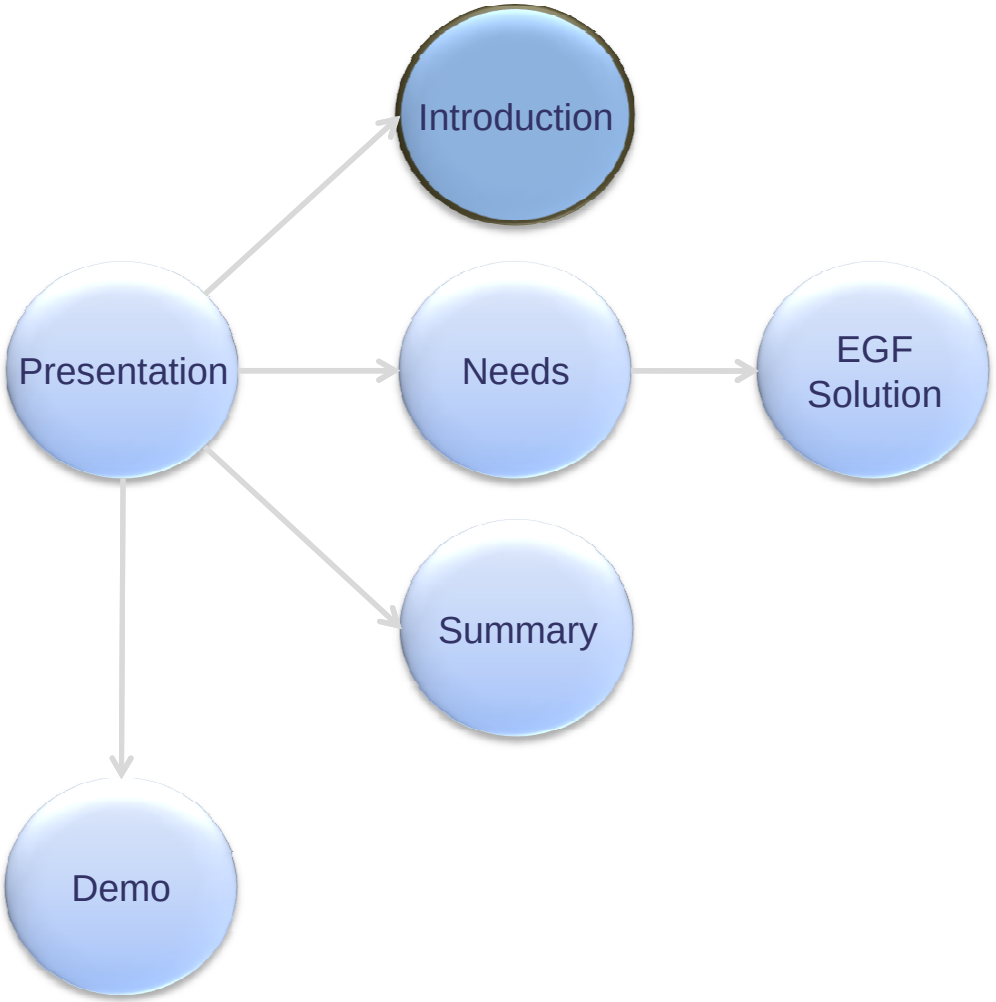


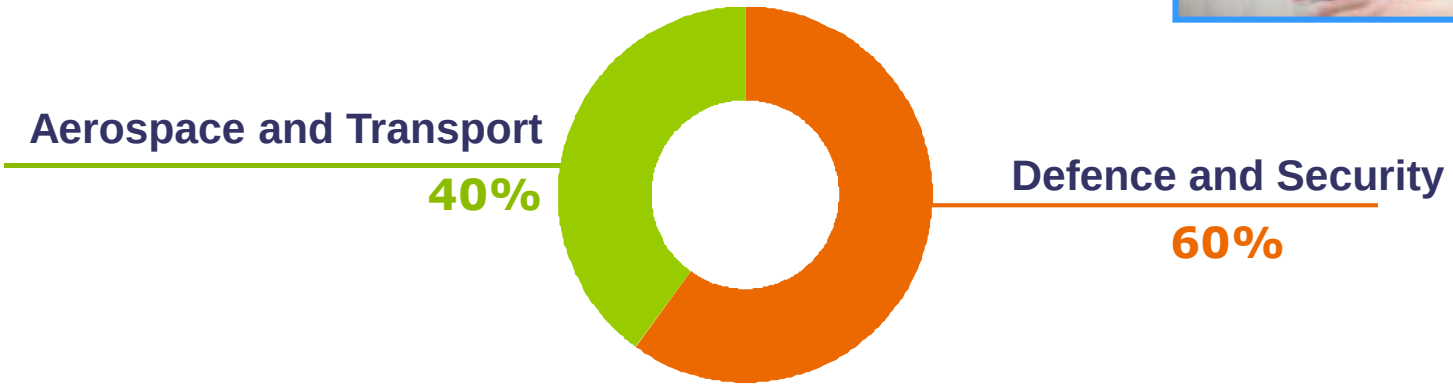
Agenda



Thales, a technology leader providing safety and security

A global company with 68,000 employees and €13.1 billion in revenues

- **We help our customers to:**
  - Provide reliable and secure solutions
  - Monitor and control
  - Protect and defend
- **In two major sectors**



Thales: a reliable, long-term partner with operations in 50 countries

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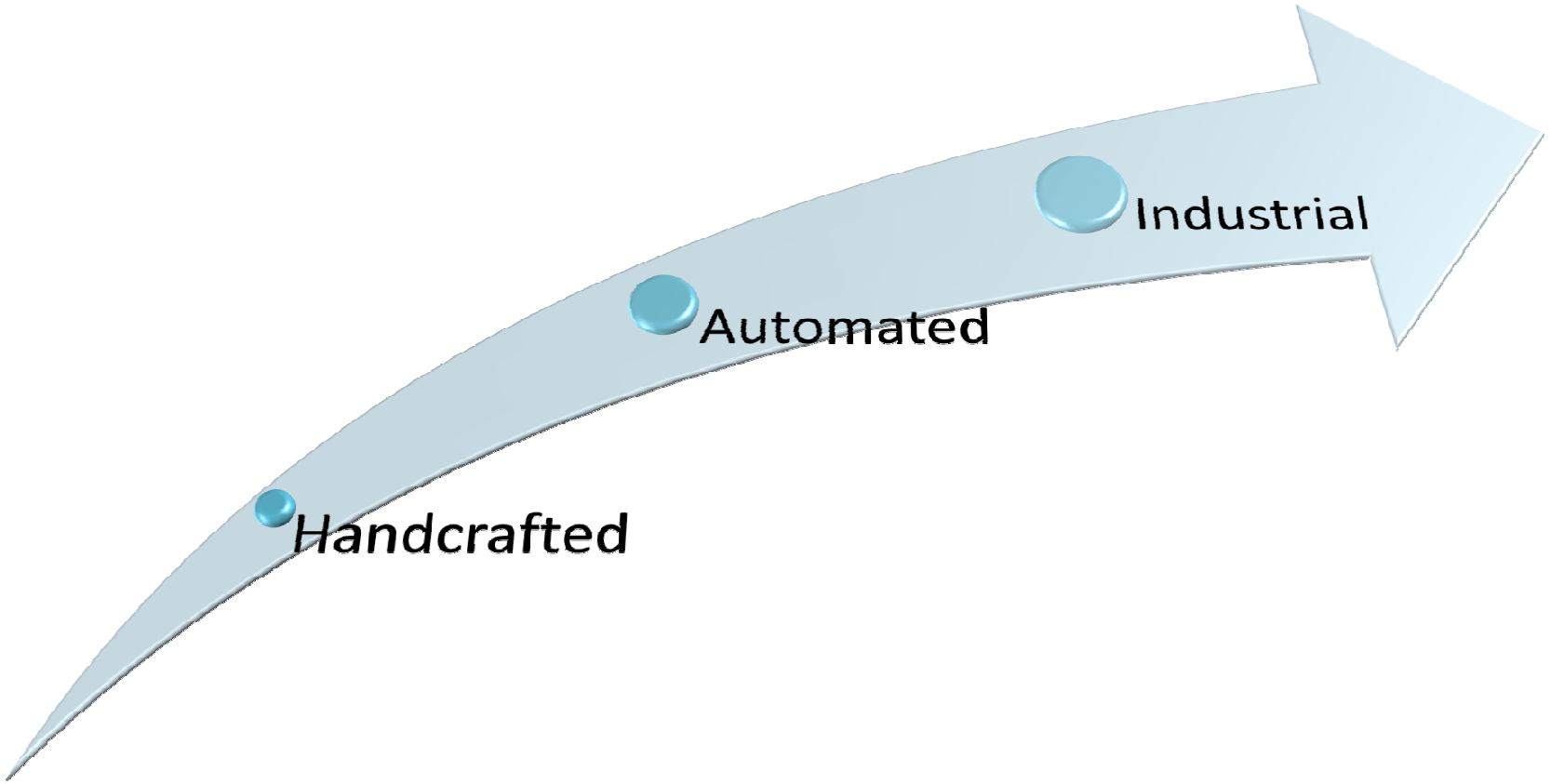
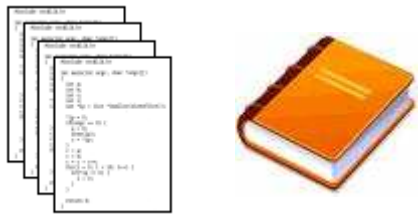
Maturity of Software Production



Generation, Basically…

Input → **Generator** → **Output**

model



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But…

Integration of heterogeneous kinds of know-how

Different types of input

Orchestration

Different types of output

Input → **Generator** → **Output**

model

File

Plug-in

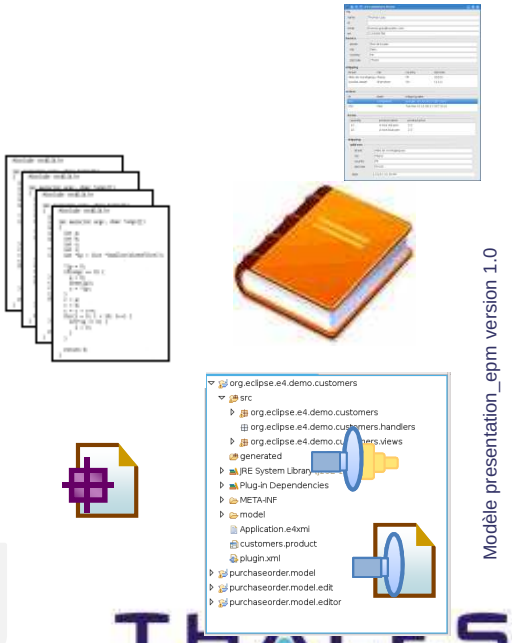
…

Different languages & Tools

Java Acceleo Ruby Jython

Framework

Variability



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Generation scope?

How to develop & test?

Executability? Distribution?

Generation reusability?

Generation customization?

What target-platform?

Variability? Product lines?

Performance, scalability?

Generation orchestration?

Generation workflow?

One-click generation solution?

Generation data, which ones, where?

Best practices, guidance?

Combining [model|text|dsl]-to-[Model|text|dsl]?

Update strategy of the produced artifacts?

Multiplicity of languages and engines?

Merging Generation?

Integration of a new language?

How to deal with Complex Generations?

Generative Software

Generation scope?

How to develop & test?

Generation reusability?

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Generation customization?

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Combining [model|text|dsl]-to-[Model|text|dsl]?

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Multiplicity of languages and engines?

Merging Generation?

Integration of a new language?

What Drivers?

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One Solution To deal with Complex Generations

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Integrated, Extensible Generation framework

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What is EGF?

EGF (Eclipse Generation Factories)

is an EMFT Component project (incubation)

Integrated to Eclipse Indigo and Juno

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What is EGF?

EGF (Eclipse Generation Factories)

is an EMFT Component project (incubation)

Integrated to Eclipse Indigo and Juno

10.000 downloads since the Indigo release (June 2011)

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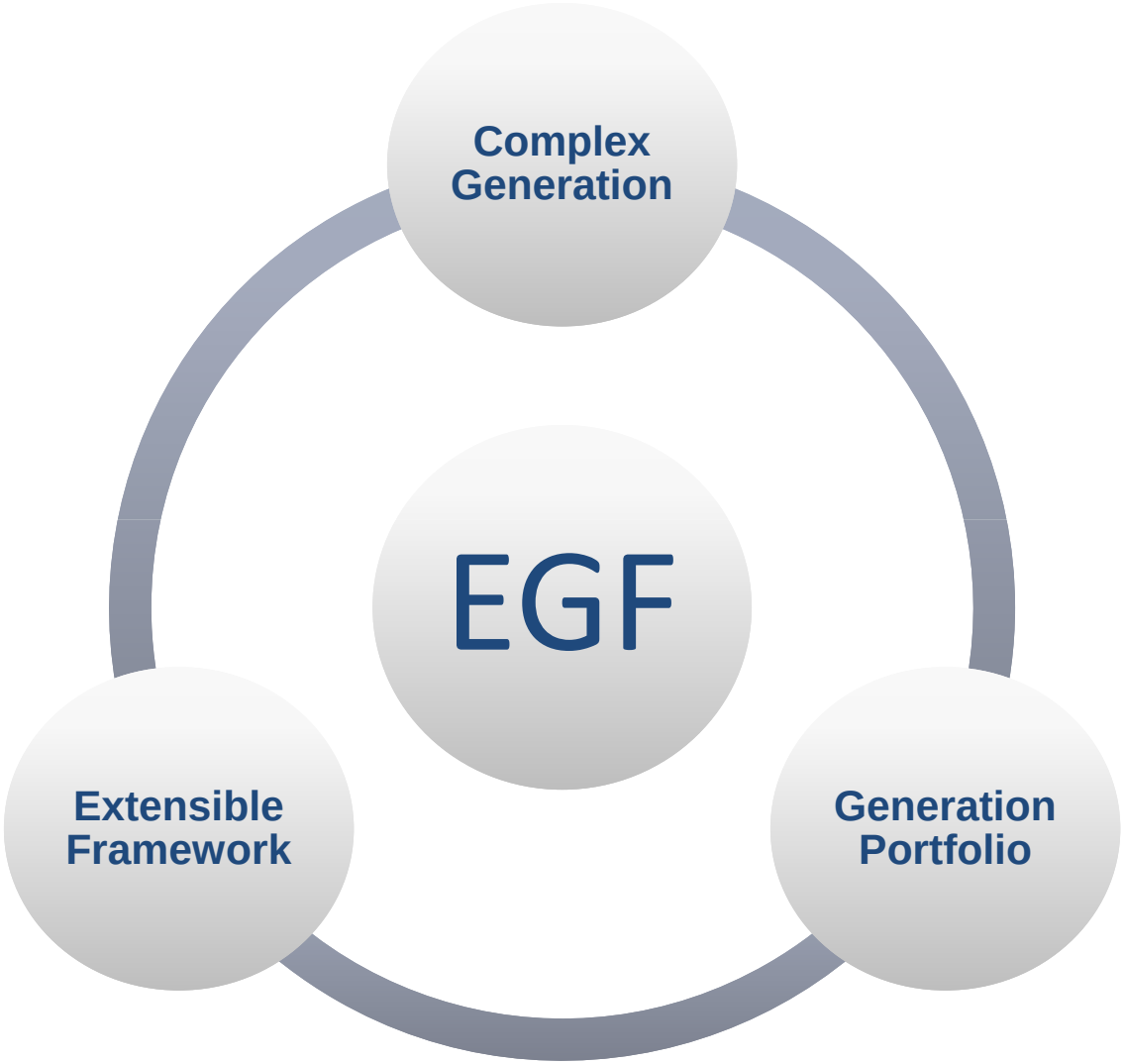
What is EGF?



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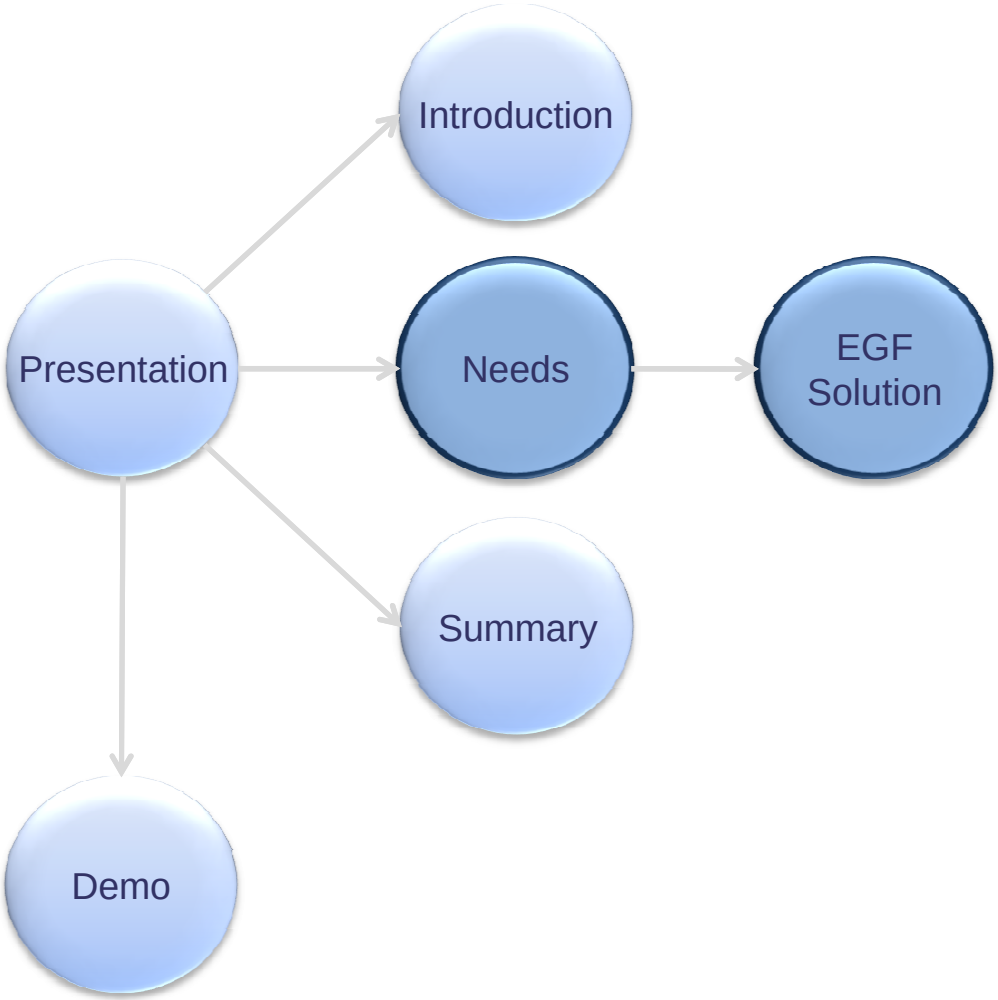

Generation in series

Need

Ability to endlessly repeat the same generation

Generation in series

Solution

Using transformation engines, such as model-to-text tools (e.g., Acceleo, Jet, xPand)

Complex Generations – Need #1

Generation in series

1. Invoking model-to-text tools

Jet …

2. Using EGF Patterns

Pattern

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Generation in series

Pattern

Systematic behavior expressed in a language (e.g., Java, Jet)

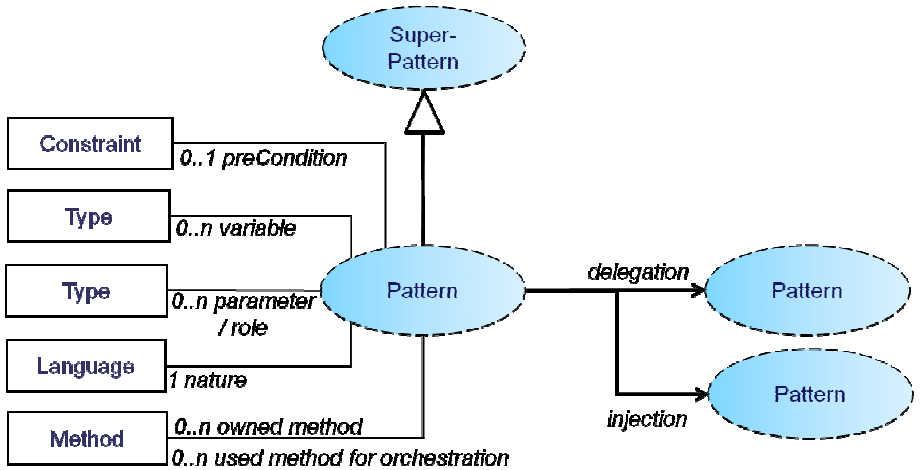
Complex Generations – Need #1

Generation in series

EGF
Eclipse Generation Factories

Pattern

Systematic behavior expressed in a language (e.g., Java, Jet)



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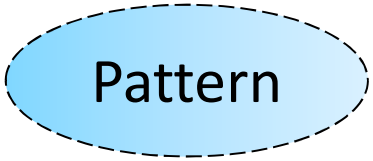
Generation in series



Systematic behavior expressed in a language (e.g., Java, Jet)

Pattern Combination (e.g., call, inheritance, substitution)

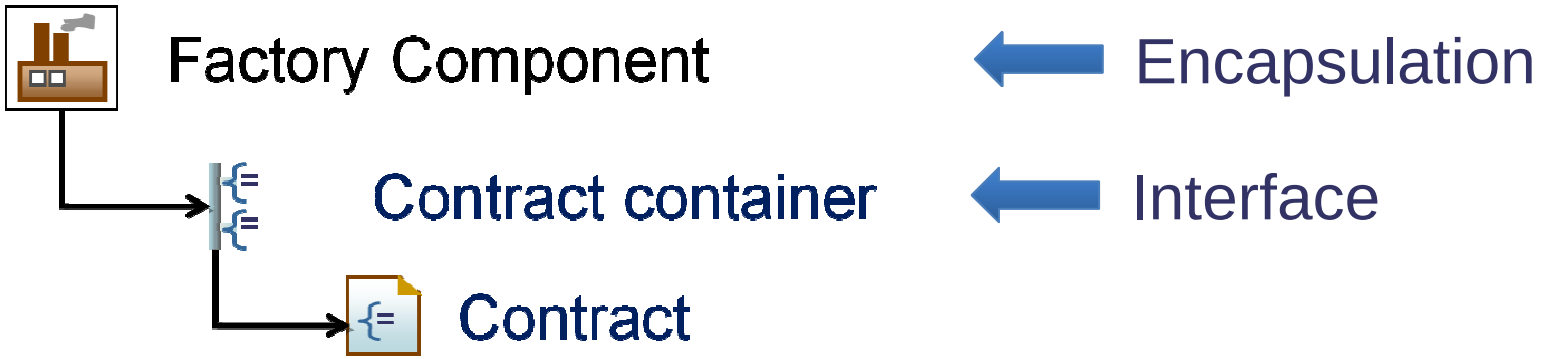
Factory Component

Need

Ability to represent a generation as a component

Factory Component

EGF
Eclipse Generation Factories



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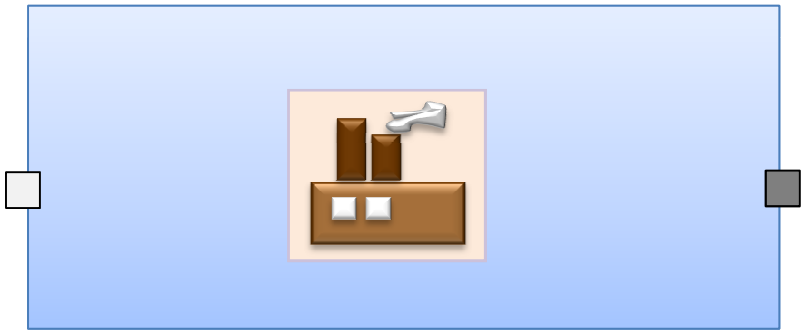
Complex Generations – Need #2

Factory Component

EGF
Eclipse Generation Factories

Substitution



Version 1

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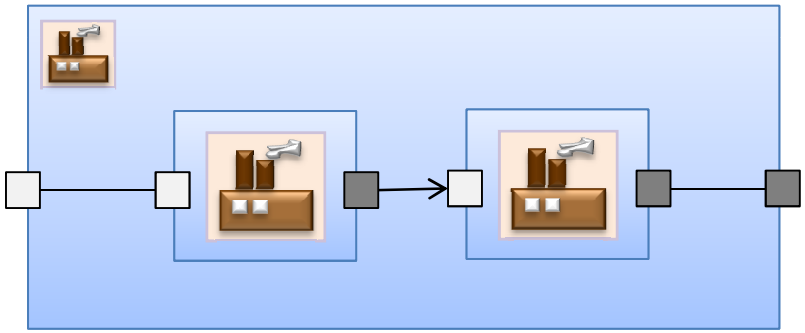
Complex Generations – Need #2

Factory Component

EGF
Eclipse Generation Factories

Substitution



Version 2

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Generation Composition

Need

Ability to compose generations

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Generation Composition

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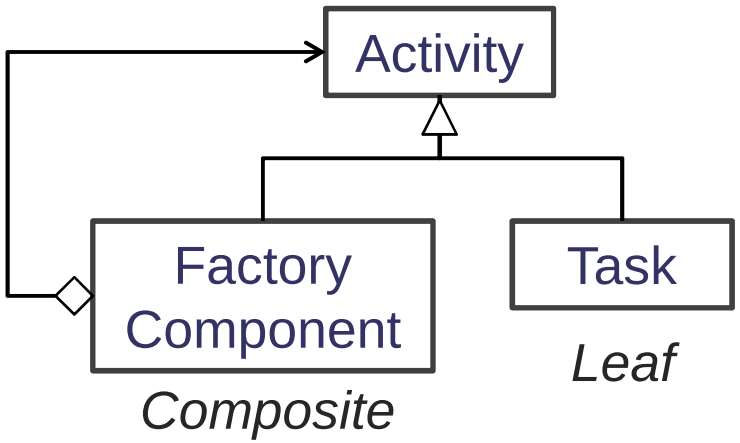
Eclipse Generation Factories



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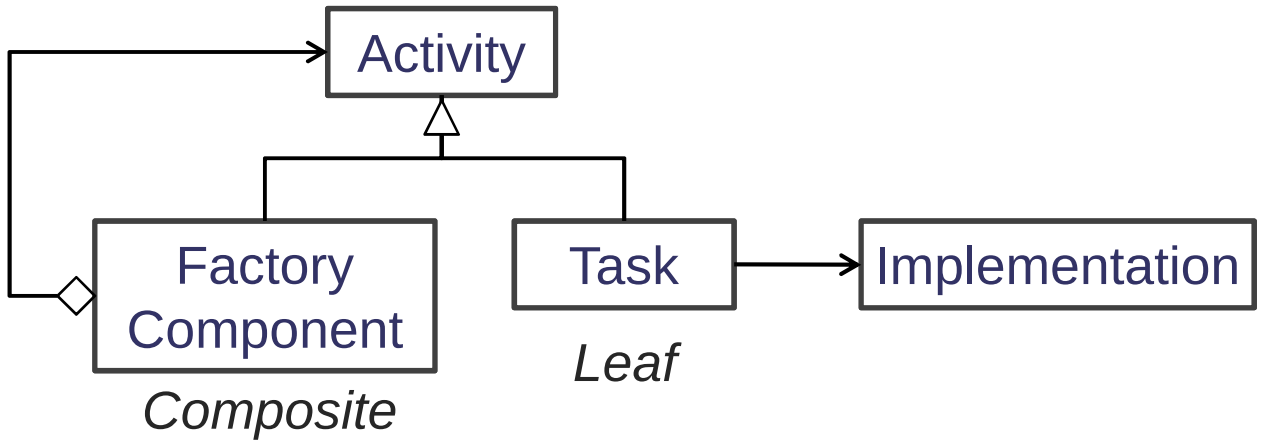
Generation Composition

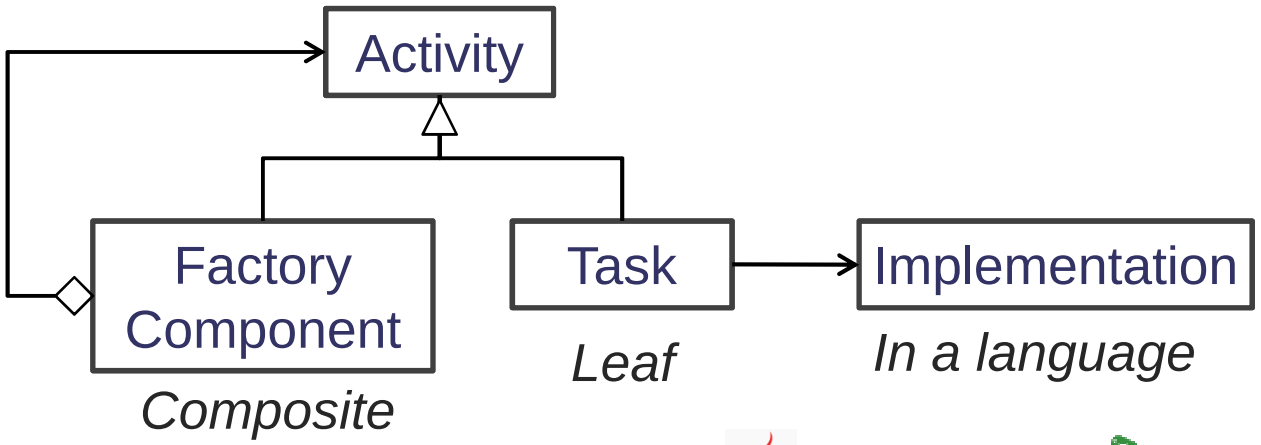
EGF
Eclipse Generation Factories



Complex Generations – Need #3

Generation Composition

EGF
Eclipse Generation Factories



Java
Jython
Ruby
Acceleo
Jet
ATL

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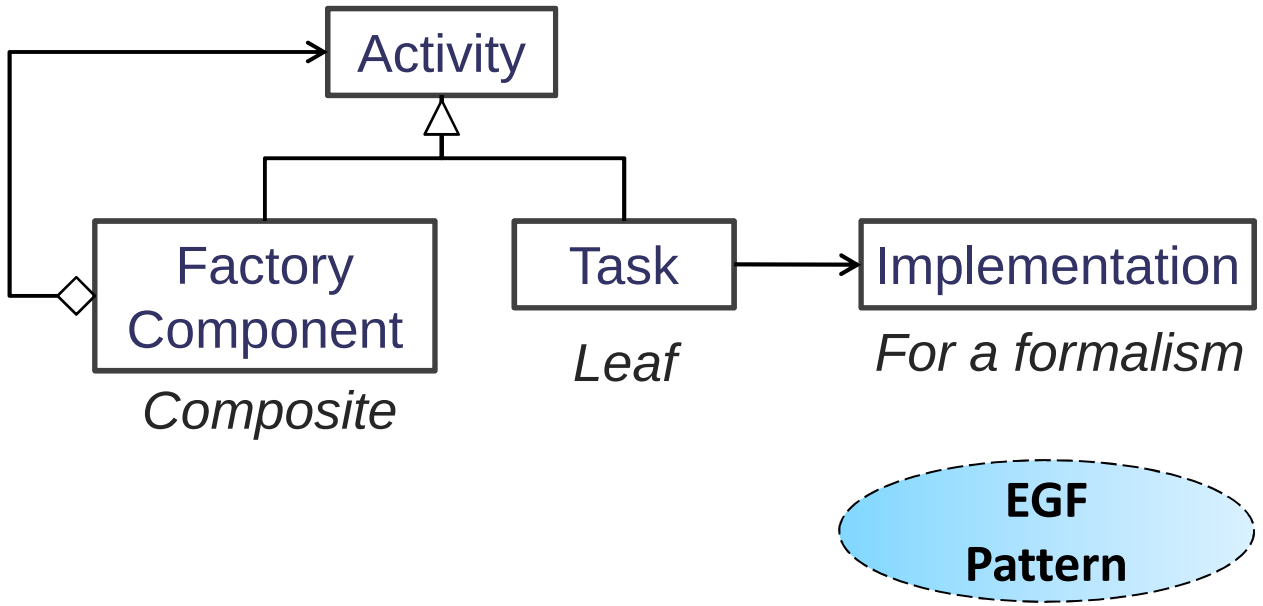
Generation Composition

EGF
Eclipse Generation Factories



Generation Orchestration

Need

Ability to conduct a generation

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Heterogeneity

Need

Ability to apply heterogeneous languages and tools during a generation

Complex Generations – Need #3

Composition

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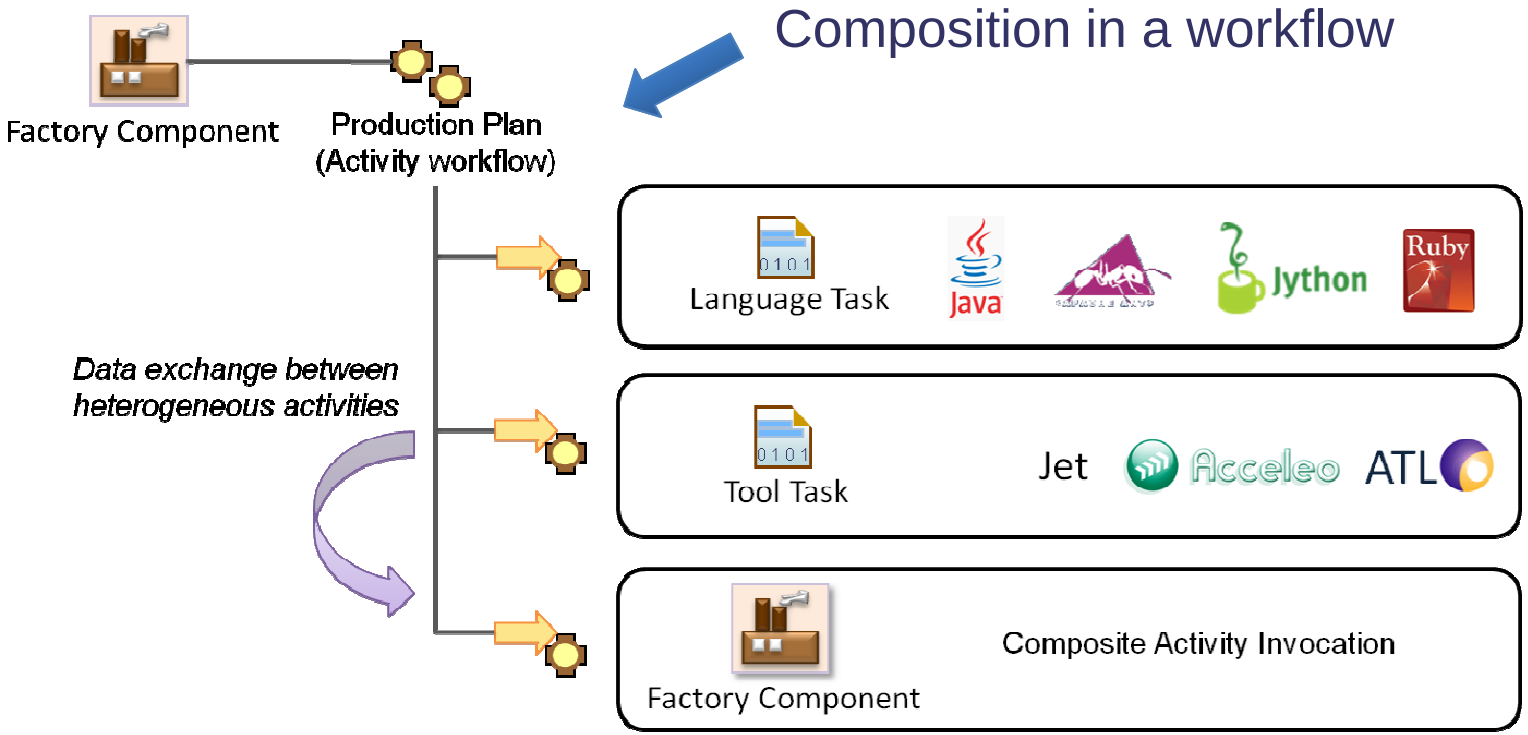
Eclipse Generation Factories



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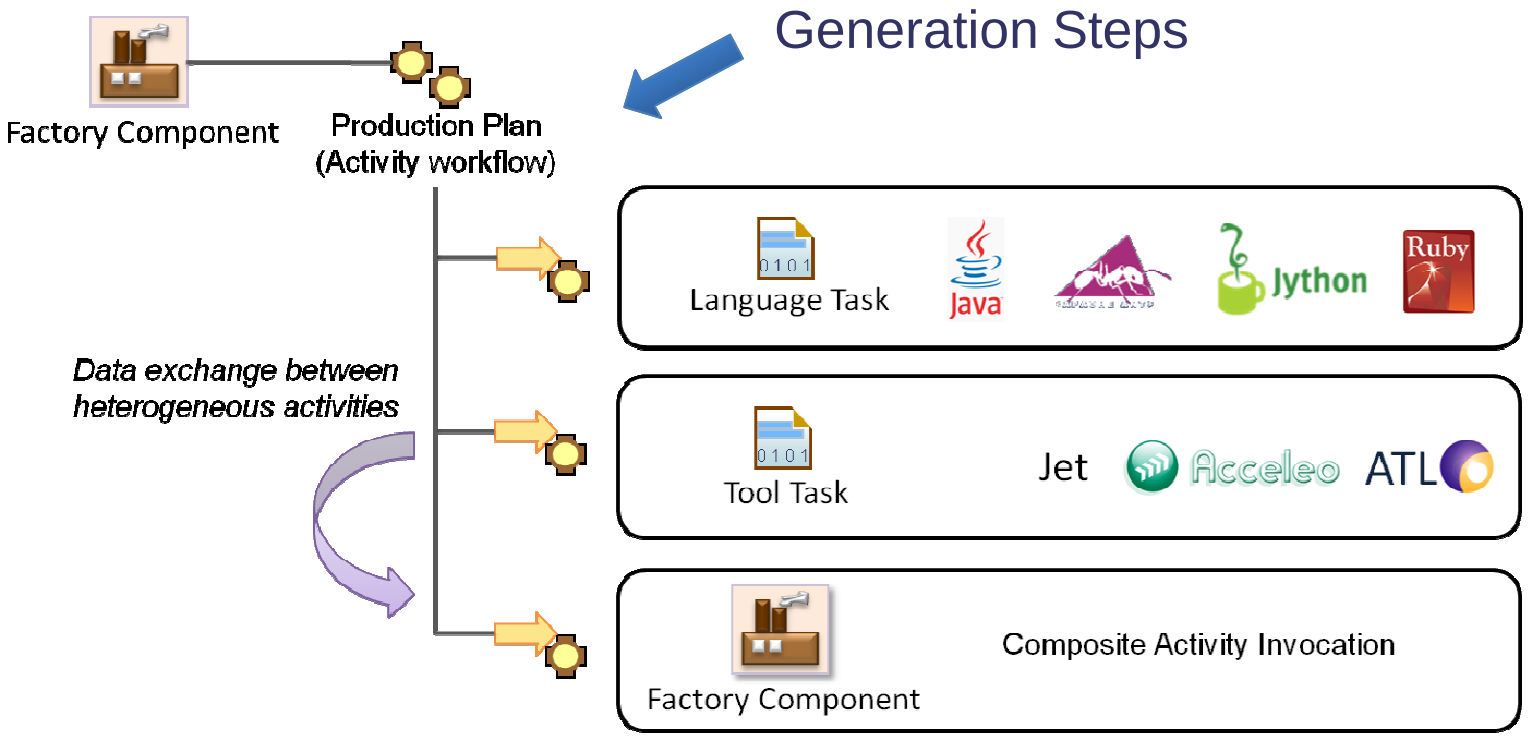
Complex Generations – Need #4

Composition **Orchestration**

EGF
Eclipse Generation Factories



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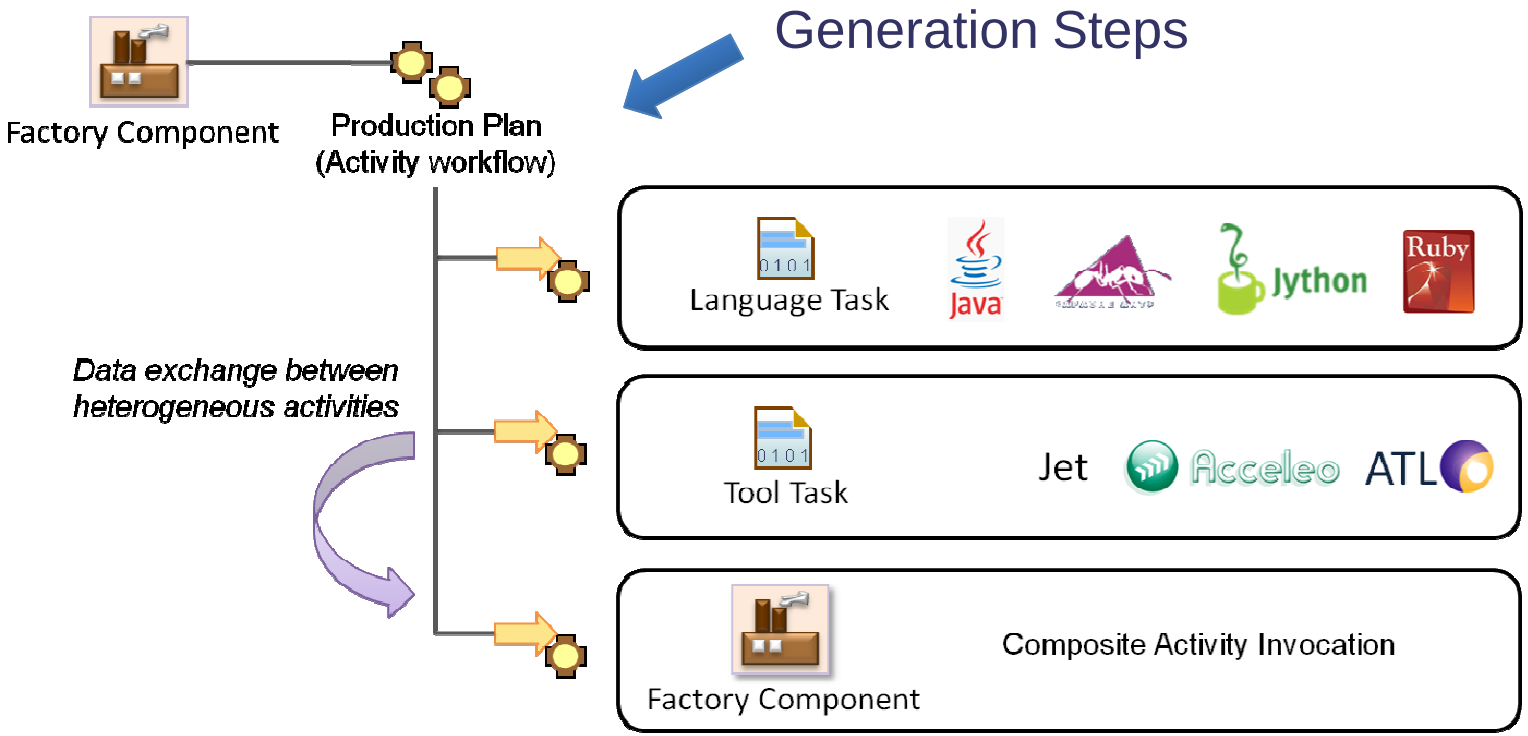
Complex Generations – Need #4

Composition **Orchestration**

EGF
Eclipse Generation Factories



Only Sequential Today

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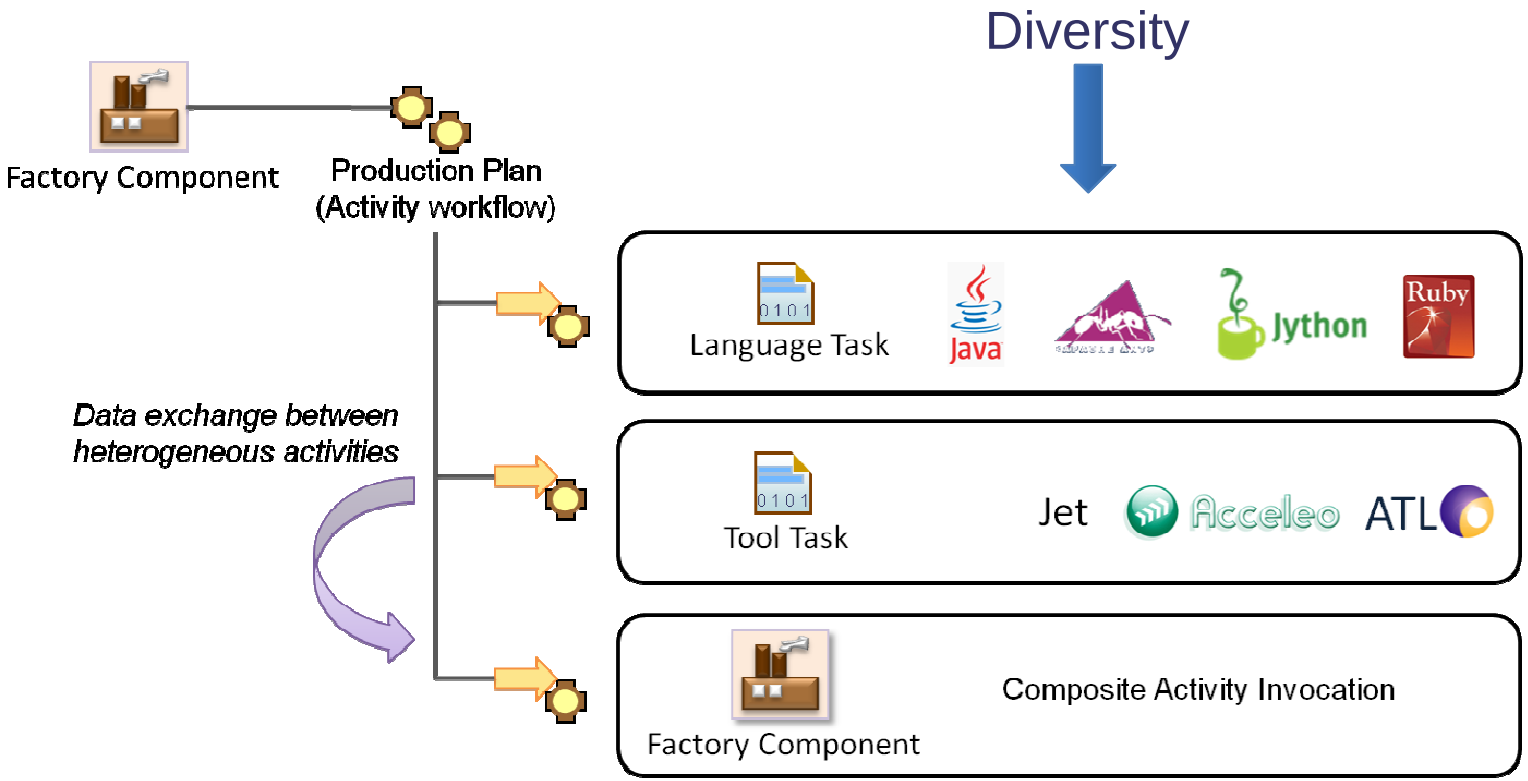
Complex Generations – Need #5

Composition **Orchestration** **Heterogeneity**



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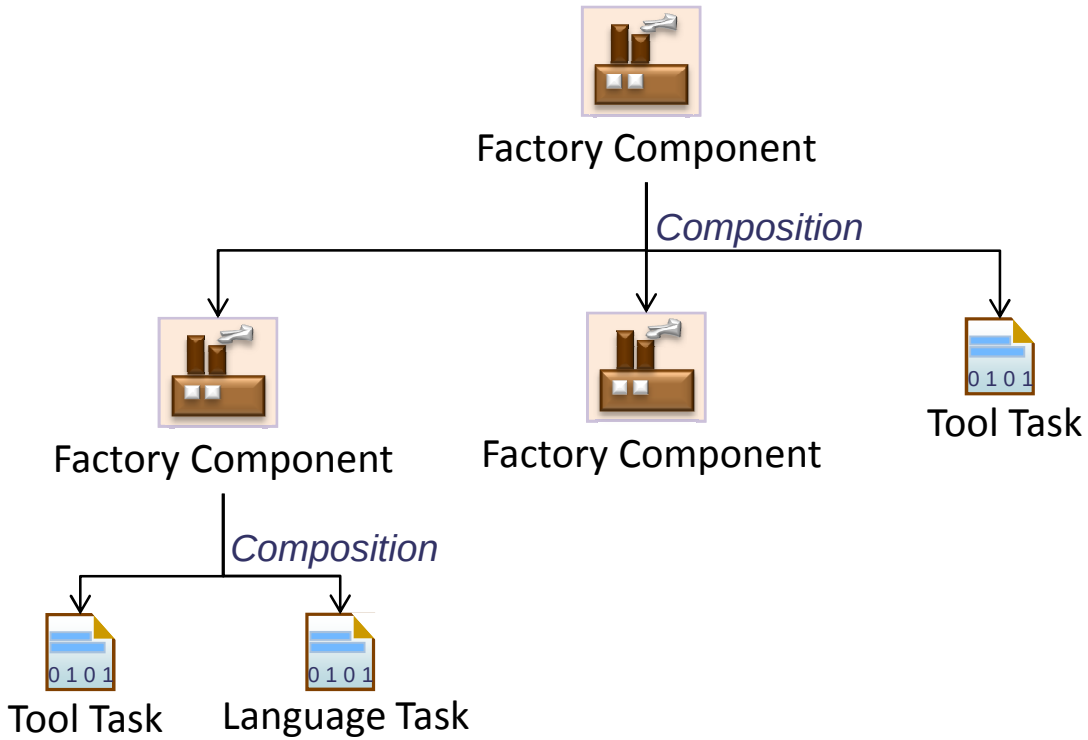
Generation Portfolio

Need

Ability to provide Factories Off-The-Shelf (FOTS)

Generation Portfolio

EGF
Eclipse Generation Factories



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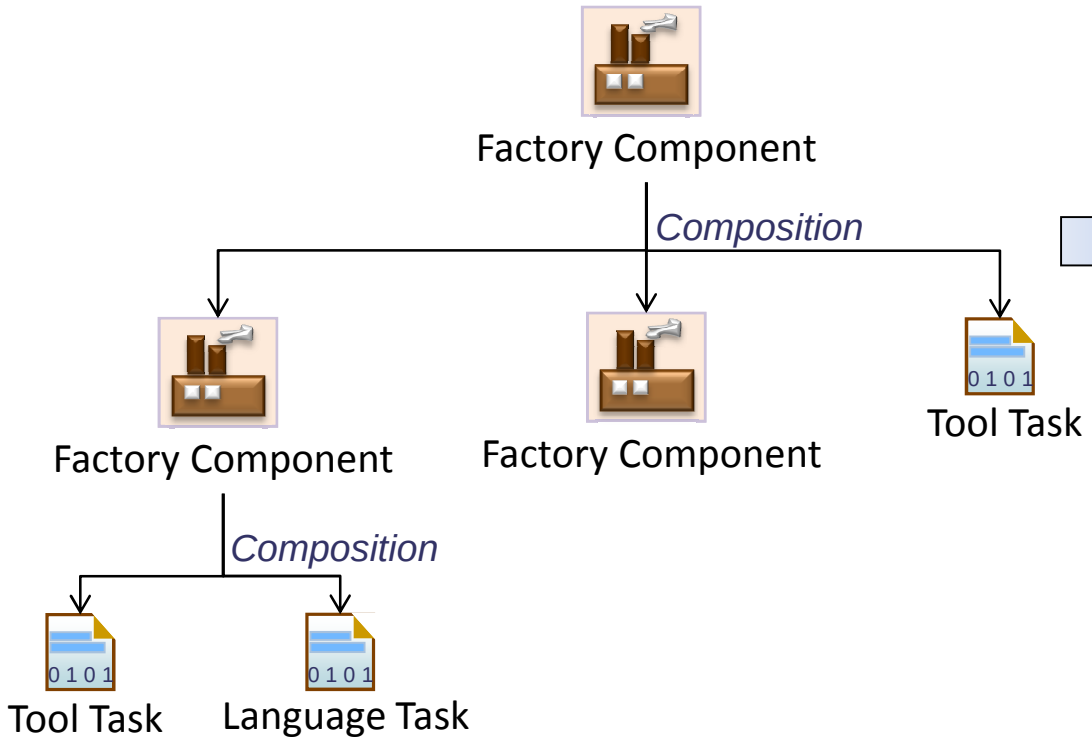
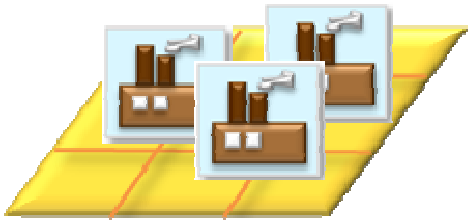
Generation Portfolio

EGF
Eclipse Generation Factories

Individual Activities



Portfolio



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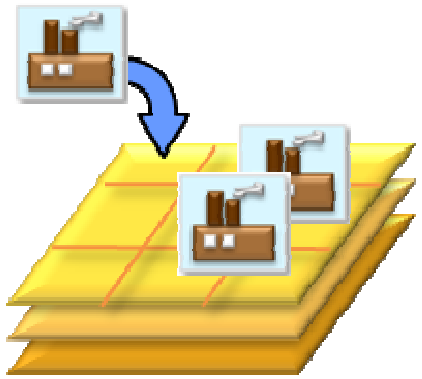
Generation Portfolio

EGF
Eclipse Generation Factories



Portfolio

Portfolio focuses on a Generation Topic

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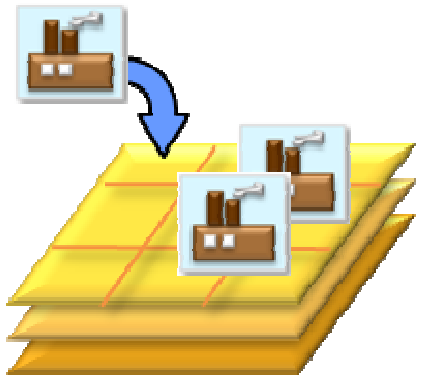
Generation Portfolio

EGF
Eclipse Generation Factories



Portfolio

Portfolio focuses on a Generation Topic

Portfolio = Set of Factory Components

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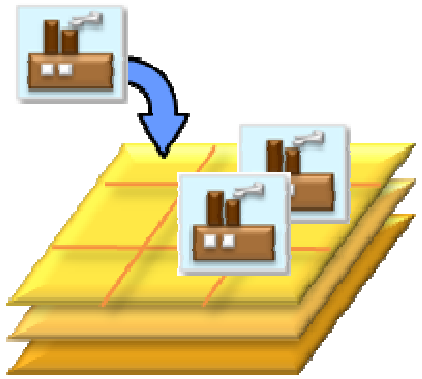
Generation Portfolio

EGF
Eclipse Generation Factories



Portfolio

Portfolio focuses on a Generation Topic

Portfolio = Set of Factory Components

Simple to Sophisticated Generation Portfolios

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Generation Portfolio

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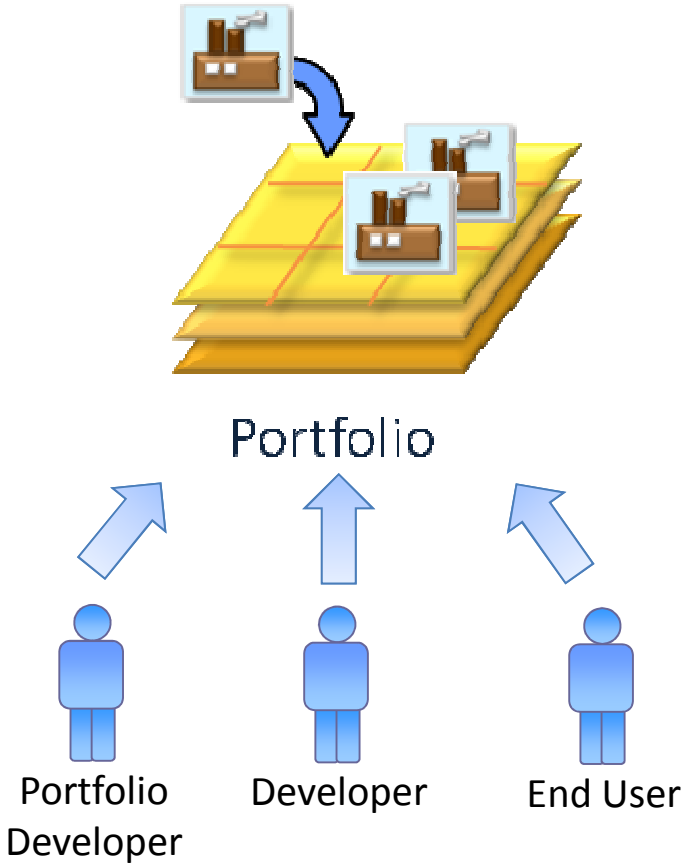
Eclipse Generation Factories



Enabler for Common development Practice

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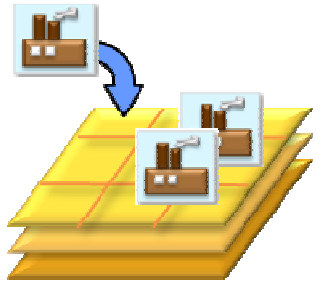
Complex Generations – Need #6

Generation Portfolio

EGF
Eclipse Generation Factories



Portfolio

Provided With EGF

emf
ECLIPSE MODELING FRAMEWORK

Enhanced EMF Generation

Build modeler and generator
For continuous integration
(Hudson/Jenkins, Buckminster today)

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Generation Variants

Need

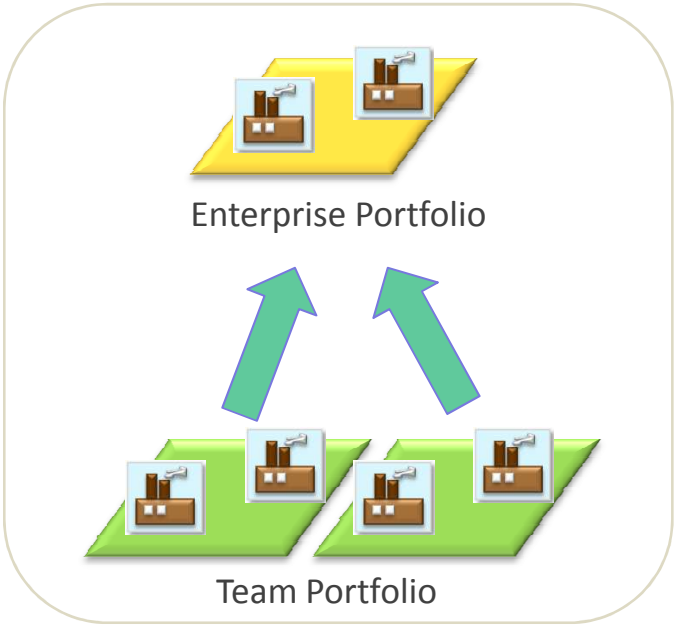
Ability to support generation variants

Generation Variants

Variability model (for product lines), not supported yet

Generation Variants

EGF
Eclipse Generation Factories



Several levels of Customization

Example

Code/textual generation
for my organization

extends

Specific generation
for my project

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Generation Variants

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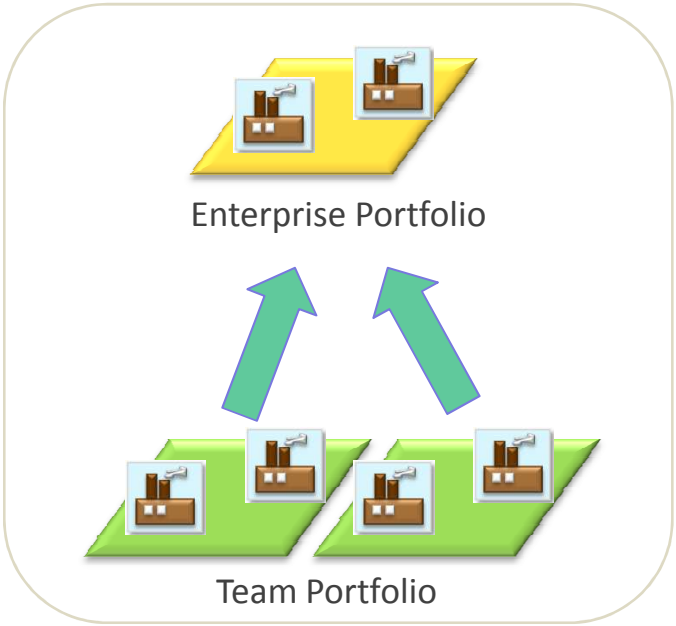
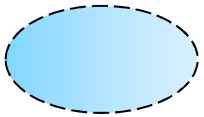
Eclipse Generation Factories



Several levels of Customization



Supported by
EGF Patterns
With the pattern substitution mechanism

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Generation DSL

Need

Ability to describe generation with a DSL

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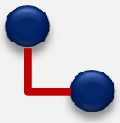
Generation DSL

EGF
Eclipse Generation Factories



Generation Chain

Definition of generation at a high level of description

Purpose: to easily define and maintain complex generations

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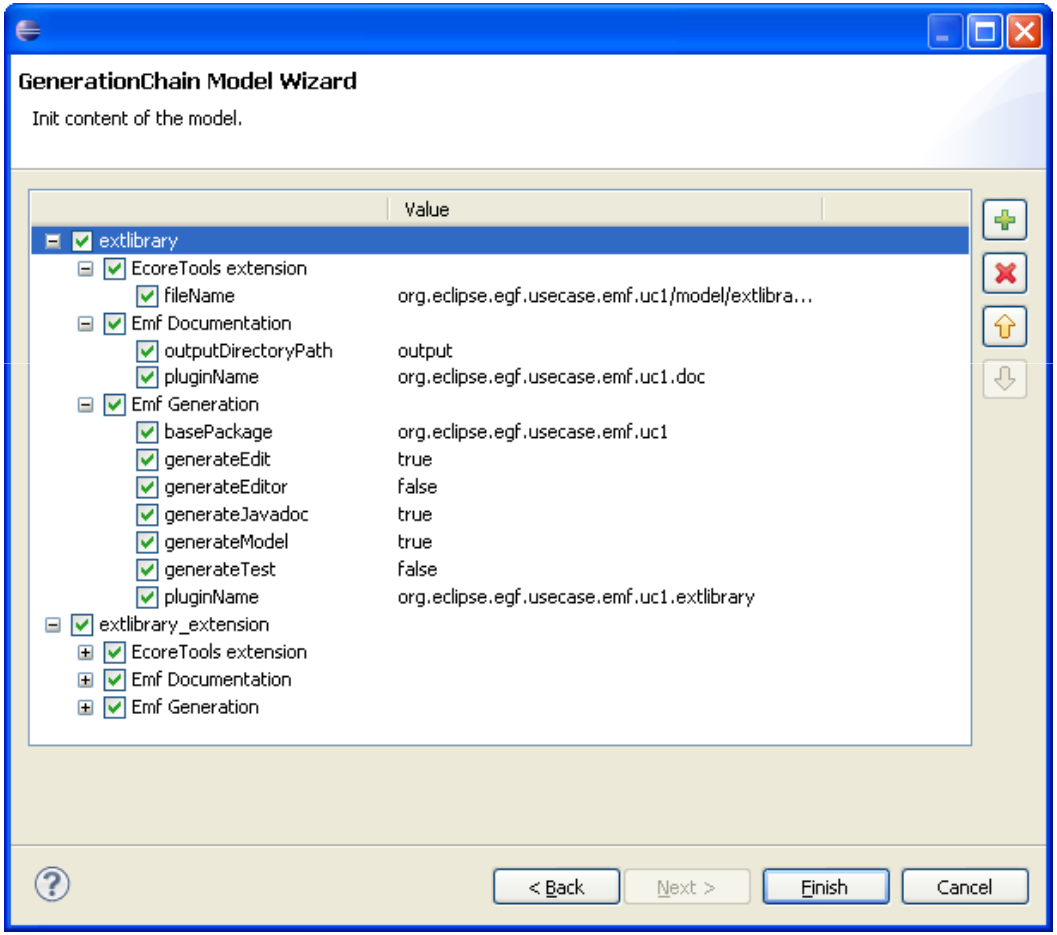
Generation DSL – Applied to the EMF Generation

Setting main features for each selected ecore models



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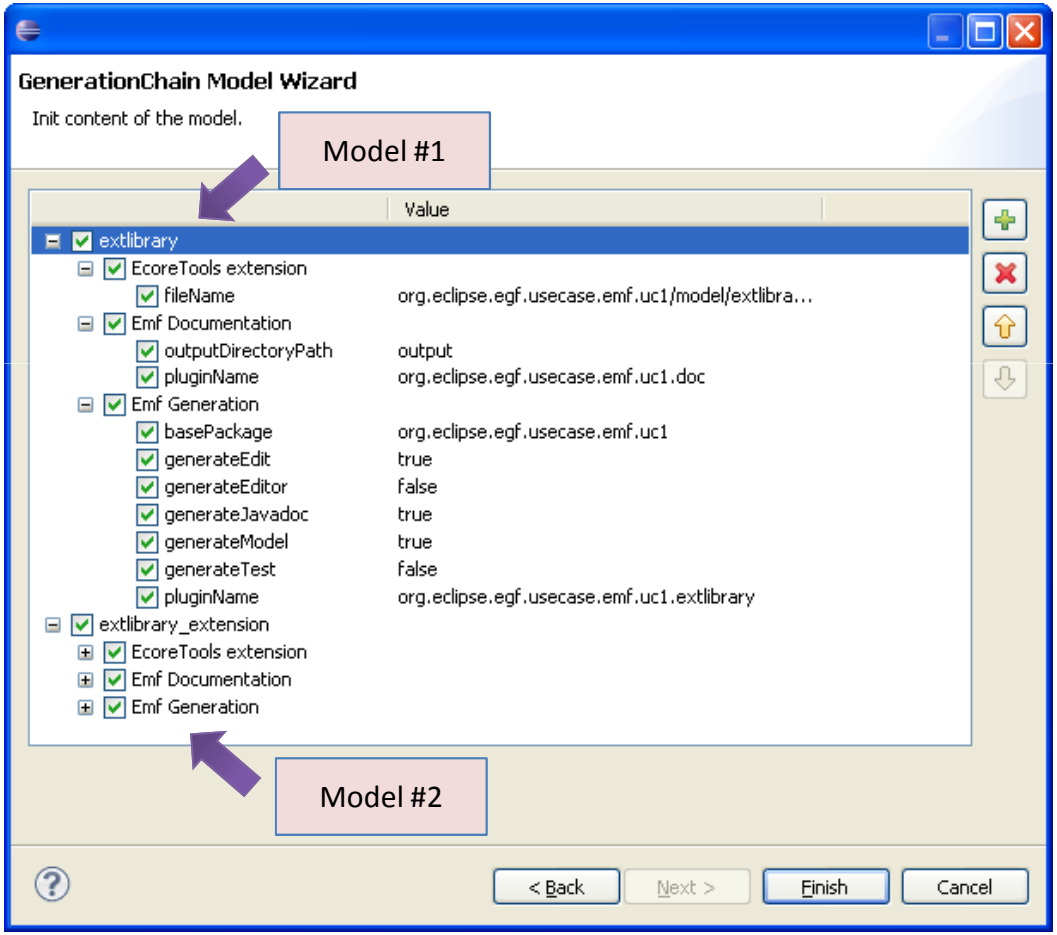
Generation DSL – Applied to the EMF Generation

Setting main features for each selected ecore models



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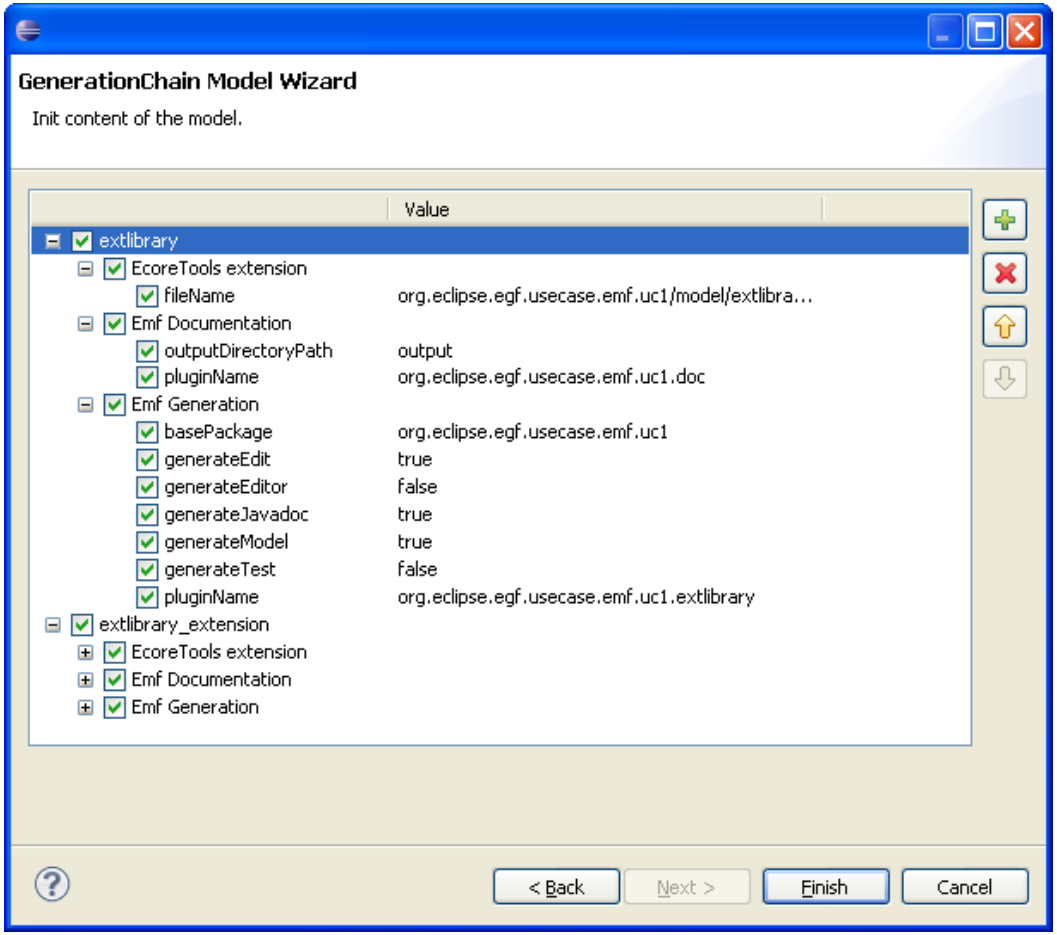
Generation DSL – Applied to the EMF Generation

Setting main features for each selected ecore models



A generation chain model is automatically created

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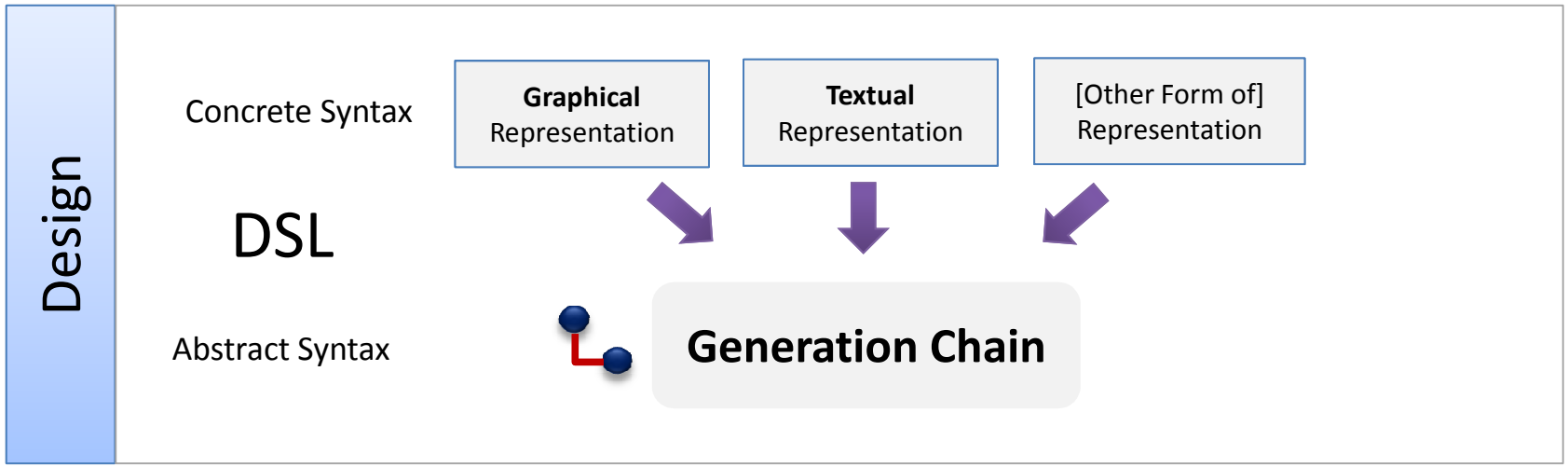
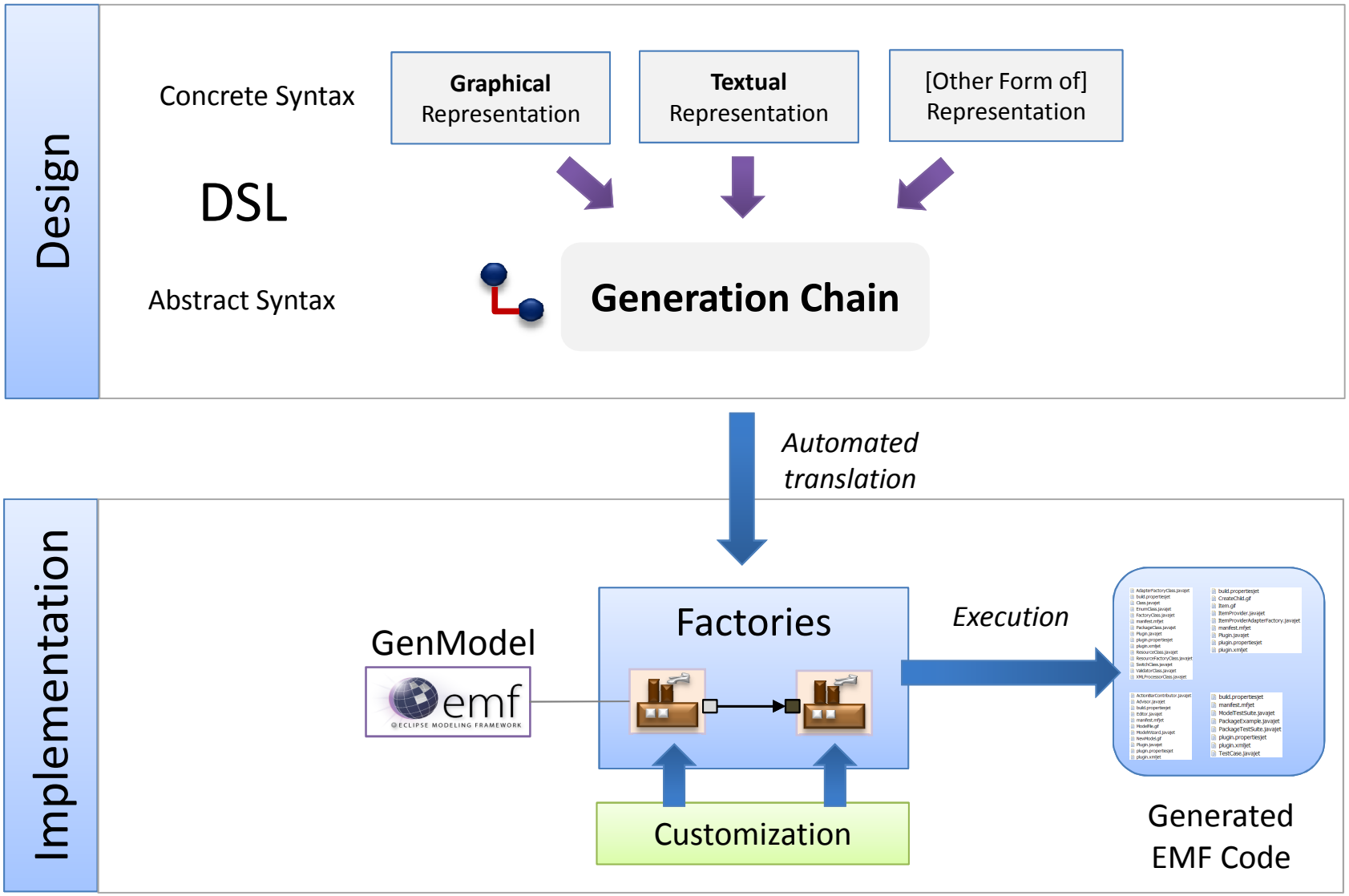
Generation DSL – Applied to the EMF Generation



Generation DSL – Applied to the EMF Generation



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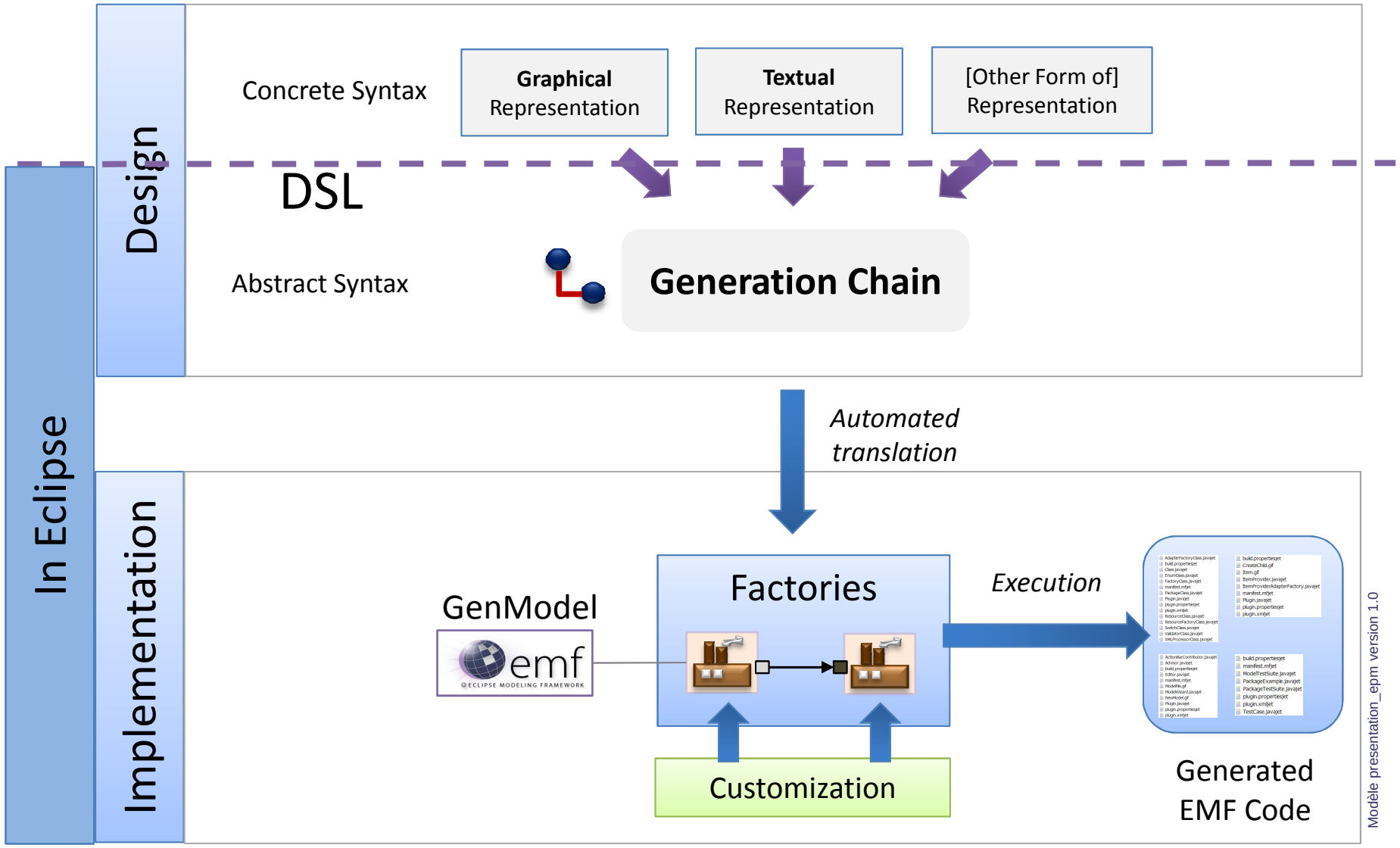
Generation DSL – Applied to the EMF Generation



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Input Diversity

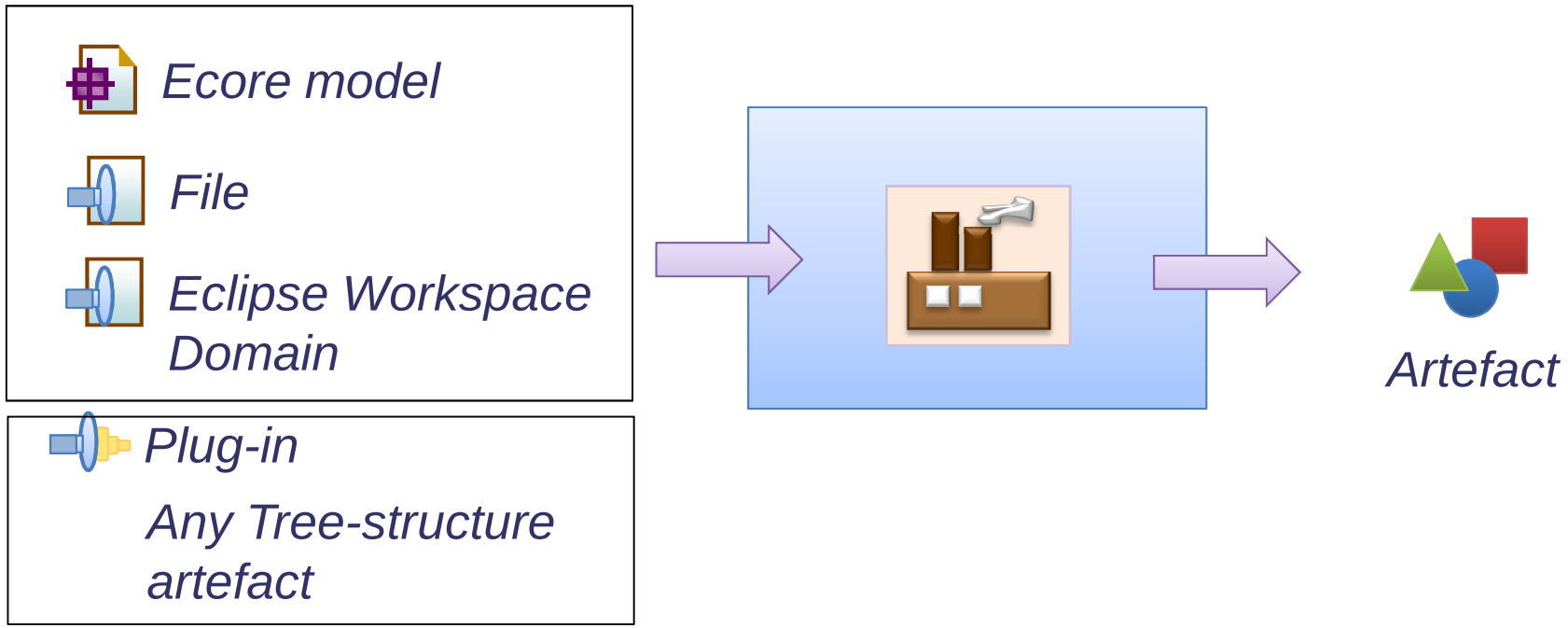
Need

Ability to apply generations from various resource types

Input Diversity

EGF
Eclipse Generation Factories

Supported today with patterns (Jet, Java)



Potentially…

Generation Strategy

Need

Ability to apply different strategies of generation on the same resources

Generation Strategy

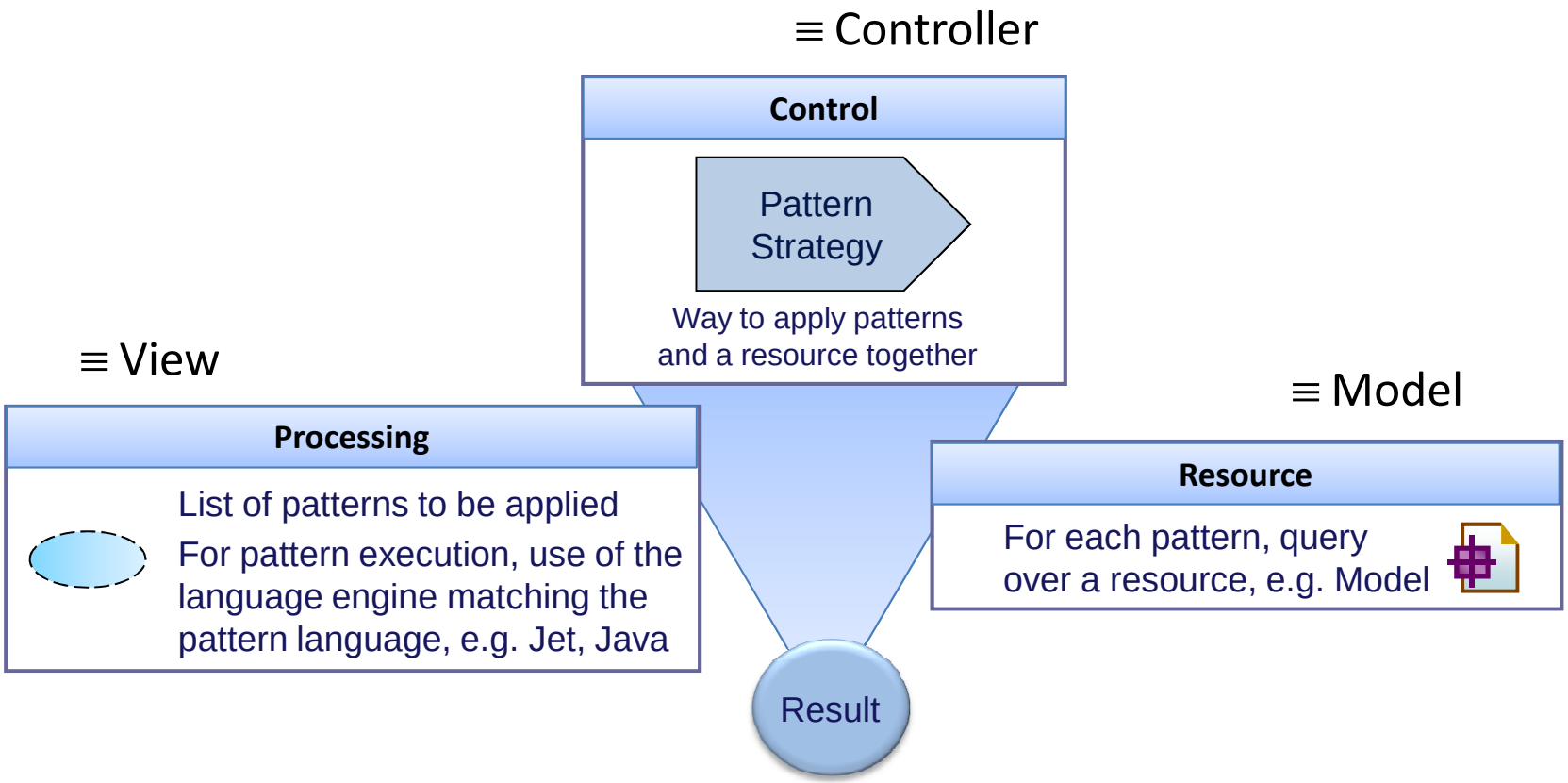
Pattern Strategy

Way to apply patterns over a resource

Complex Generations – Need #10

Generation Strategy

EGF
Eclipse Generation Factories



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Generation Strategy

Examples of Pattern Strategies

Domain-driven pattern strategy: in-depth navigation over a resource (e.g., model, file); for each model element, applying a set of patterns

Pattern-driven strategy: for each pattern, applying the pattern to each resource element

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Generation Strategy

Examples of Pattern Strategy Options

Resource visitor: When navigating over a resource, the visitor function specifies how to continue this navigation. Example: considering the sub-classes of the current resource element

Reporter: Specification of the responsible for reporting a model-to-text transformation

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Complex Generations – Other Needs

Post Processing

In progress

From Generations to Industrialized Software Production

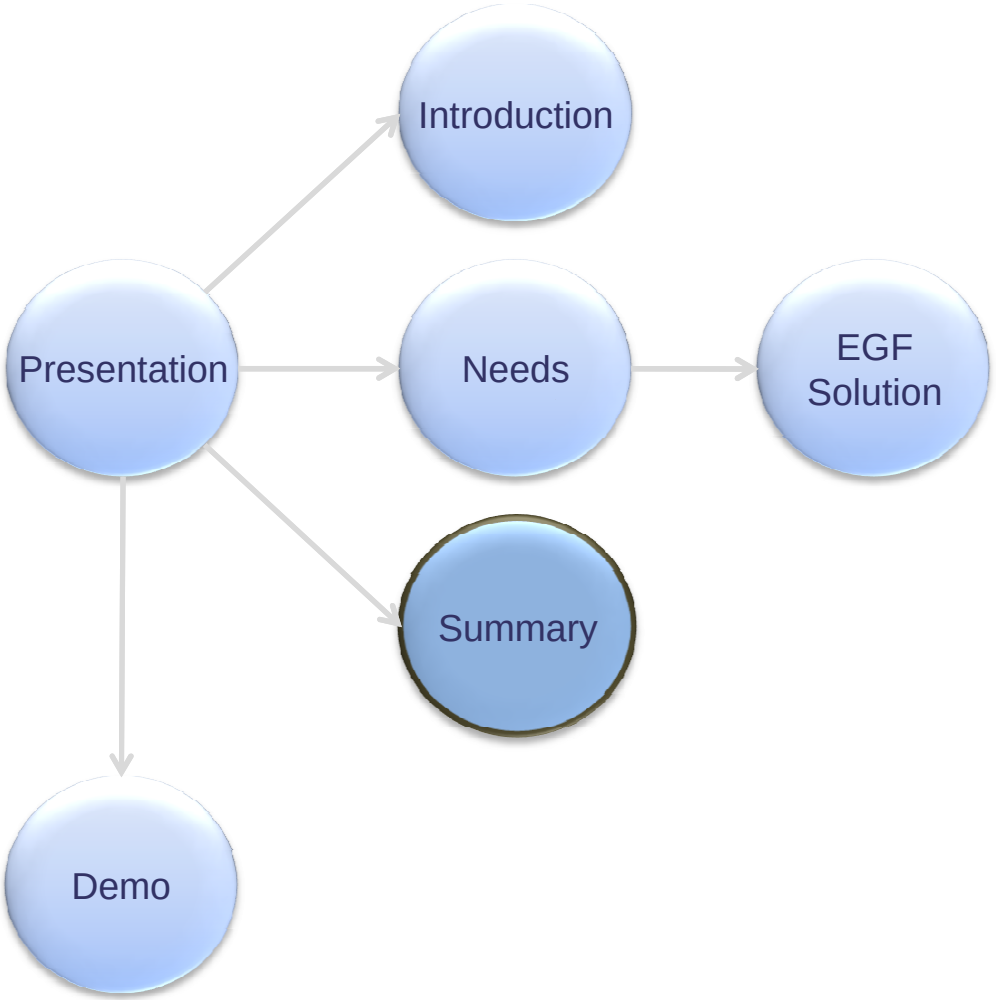
EGF can used in other concerns than Generation

Ex: Validation, Transformation

Portfolio & Reusability contribute to define Generation Framework

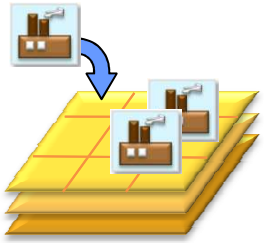
With maturity, “Factory” has more and more the meaning of “Automation”

Agenda

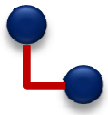


Summary of the main EGF concepts

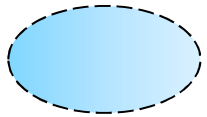
Factory Component
Composite generation unit with an activity workflow
Task
Leaf generation unit written in a language (e.g., Java, Ruby)



Portfolio
Capitalization on a specific generation topic



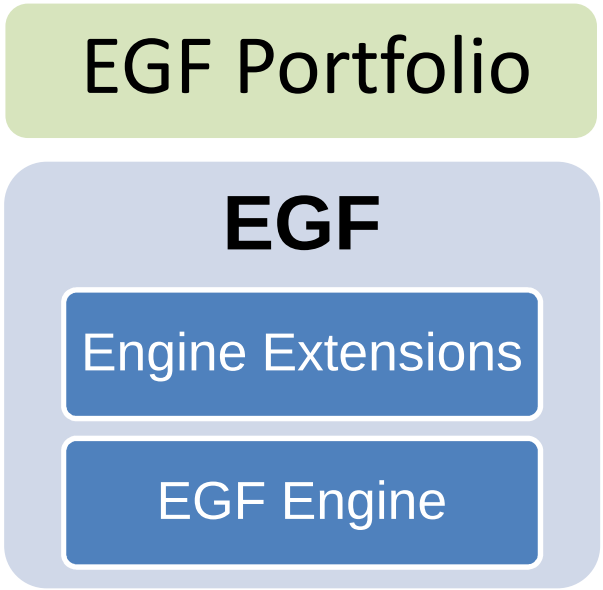
Generation Chain
High generation view to define complex generations



EGF Pattern
- Description of systematic behavior
- For definition of code generation families

EGF Extensibility

Architecture



EGF Extensibility

Extensibility

All metamodels are extensible

Possibility to define new Activity type for new paradigms

Possibility to add new pattern languages

Generally, costly at this level

EGF Portfolio

EGF

Engine Extensions

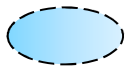
EGF Engine

Provides basic metamodels and behaviors to automate software production

EGF Metamodel

Basic behaviors, dynamic execution

Factory component, task



Pattern

Modèle presentation_epm version 1.0

THALES

EGF Extensibility

Extensibility

Possibility to add new languages and tools as tasks

Possibility to add new pattern strategies

EGF Portfolio

EGF

Engine Extensions

EGF Engine

Meets specific software production needs

Language & tools interoperability

New types of generation formalisms

Modèle presentation_epm version 1.0

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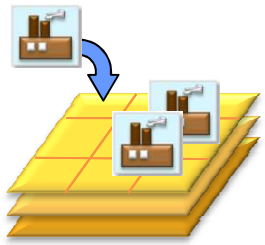
EGF Extensibility

EGF Portfolio

EGF

Engine Extensions

EGF Engine



Portfolio

Portfolio = generation topic

Simple to off-the-shelf software factories

Examples of Portfolios provided with EGF

Enhancement of the EMF Generation

Build modeler and generator

Extensibility

Generation redefinition with pattern substitution

Task supports inheritance, which enables property and behavior redefinition

Development of (new types of) portfolios

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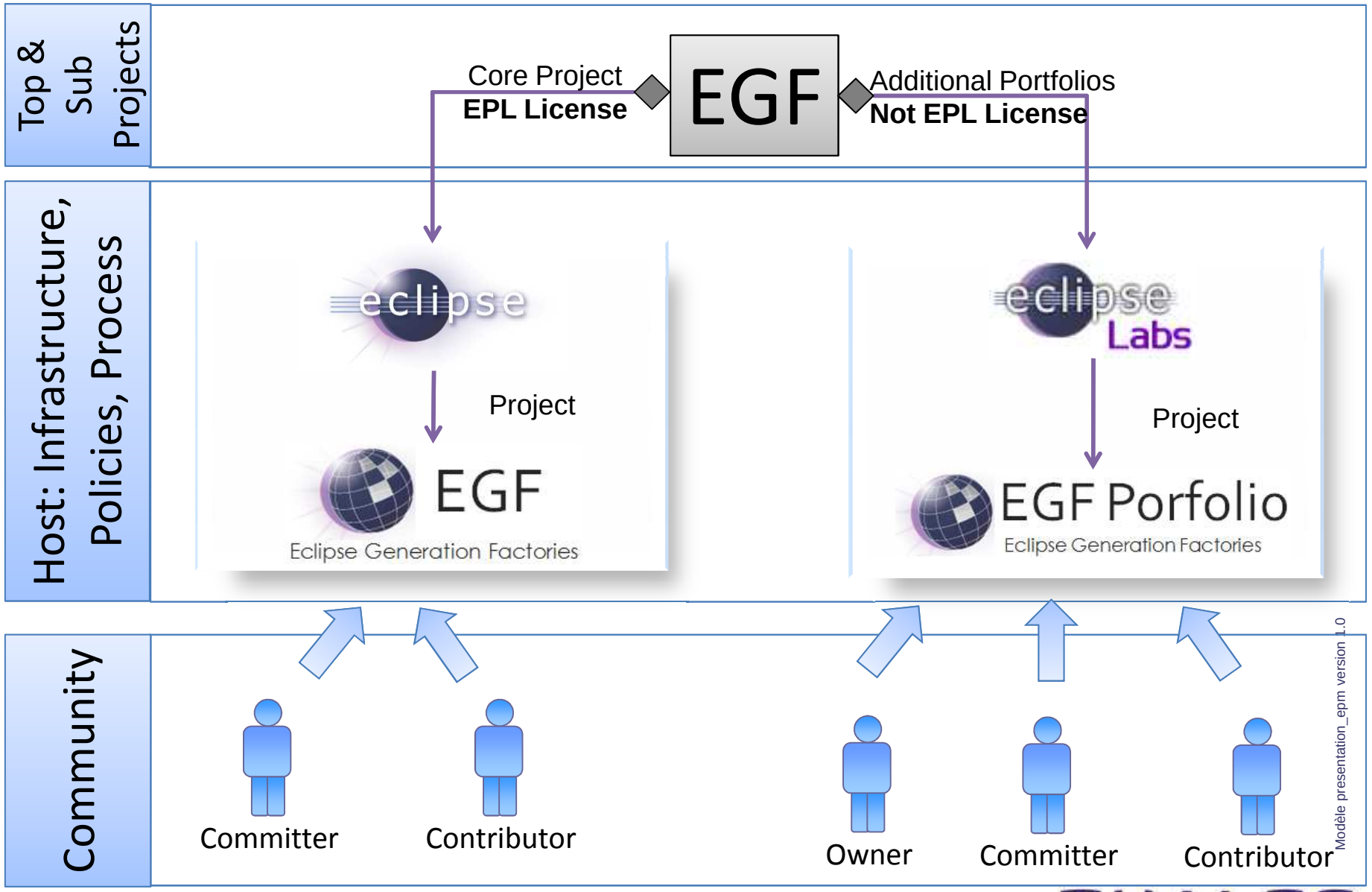
Project Organization



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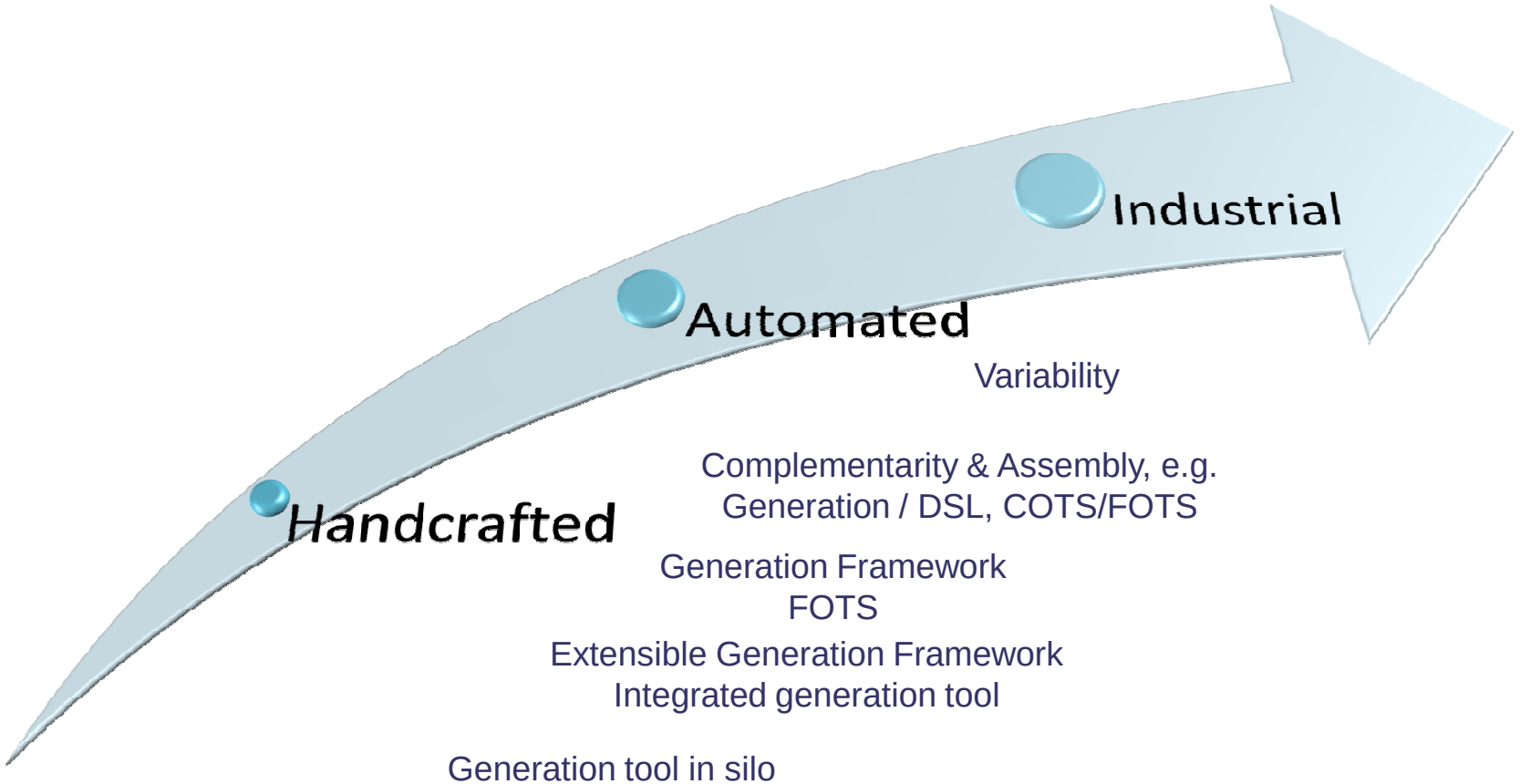
Maturity of Software Production



Variability

Complementarity & Assembly, e.g.
Generation / DSL, COTS/FOTS

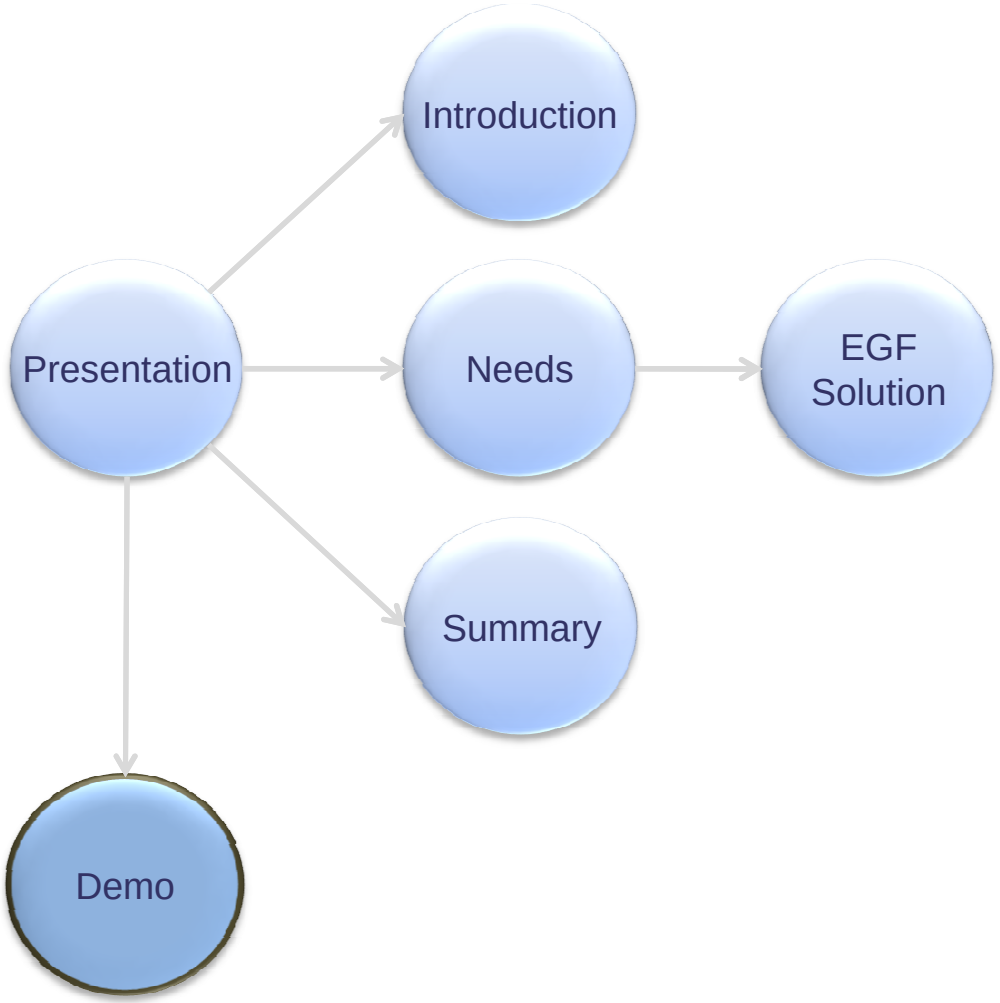
Generation Framework
FOTS

Extensible Generation Framework
Integrated generation tool

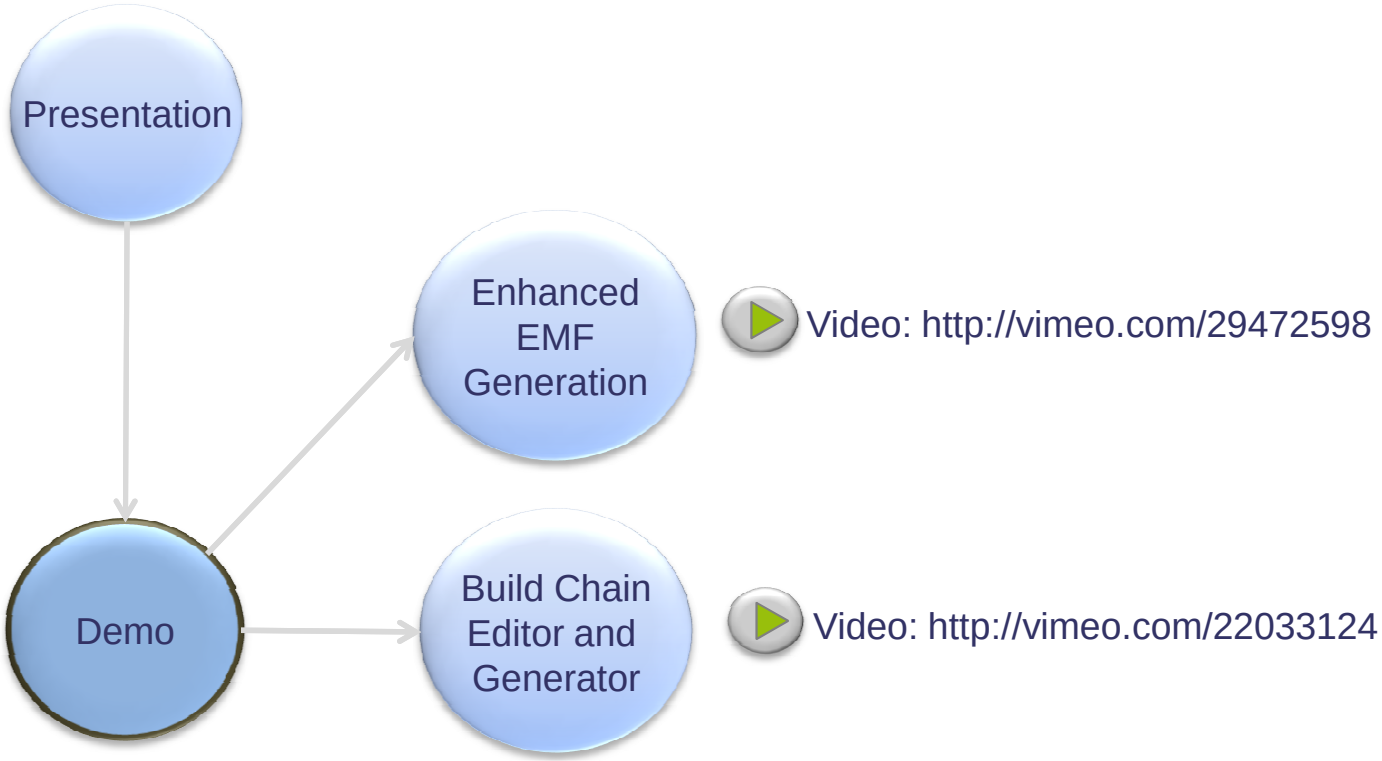
Generation tool in silo

Hand-written Code

Agenda



Agenda



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Download

by update site from Indigo
by update site from Amalgam

http://wiki.eclipse.org/EGF_Installation

General info about EGF

Project page: http://www.eclipse.org/egf
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