GENERATION CHAIN

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DEFINITION

A generation chain defines, at a high level of description, a sequence of generations.

OBJECTIVES

The objectives of a generation chain are to:

- Reduce the time to define a suite of generations,
- Work at an action semantic level, instead of at the implementation level, and encapsulate the irrelevant details of generation.

The interests are to:

- Reduce the complexity of a sequence of generations by abstraction of information about generation parameters and actions,
- Simplify the definition and maintenance of a sequence of generations,
- Manage large generations, for instance for a battery of models.

Note: The "Generation Chain" technique has been first applied to Emf, even if the infrastructure is ready to support other kinds of resources.

CONCERNS

|	
Designer	• The designer focuses on the generation actions and validates the achievement of the complete generation. • The designer executes the generation chain.
Developer	• The developer adjusts the details defined by the designer or at creation time. • The developer executes the generation chain.
Engine	• An engine executes in headless mode (i.e., batch) a generation chain.
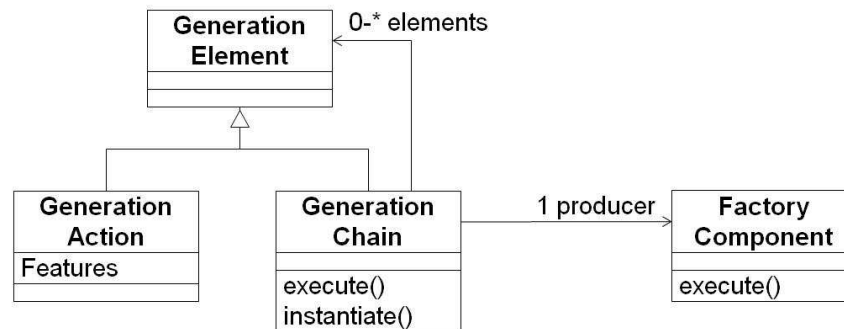
STRUCTURE

Figure 1. Generation Chain Structure

Comprehension:

- A generation chain is a tree where leaves are generation actions
- A generation action contains generation features which are the generation parameters at a high level of description
- A generation chain is executable
- To be executable, the complete generation chain is translated into factory components by an instantiation operation. Factory components are in charge to produce the expected artifacts.

Example:

The following example depicts a generation chain with two kinds of generation actions: 1) [Emf Generation] and 2) [Documentation Generation]. The Emf Generation node properties have for value the Emf parameters which drive an Emf generation.
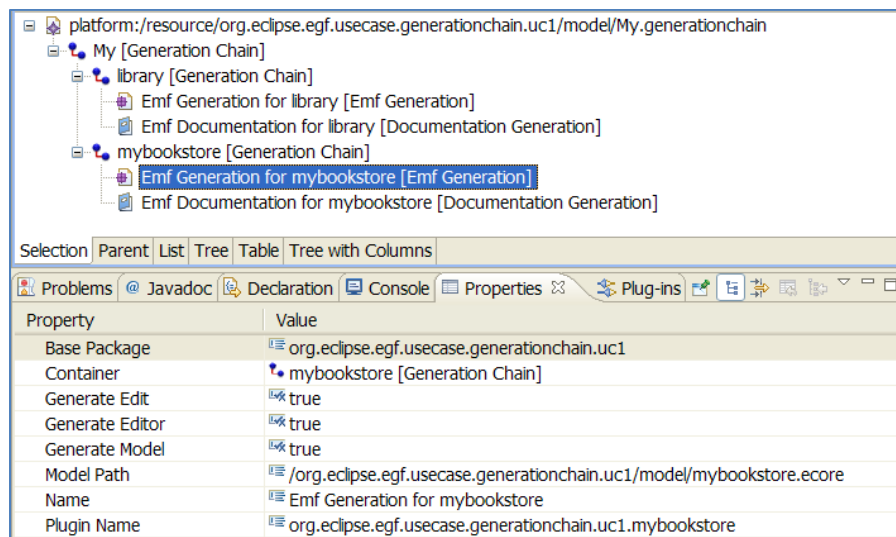

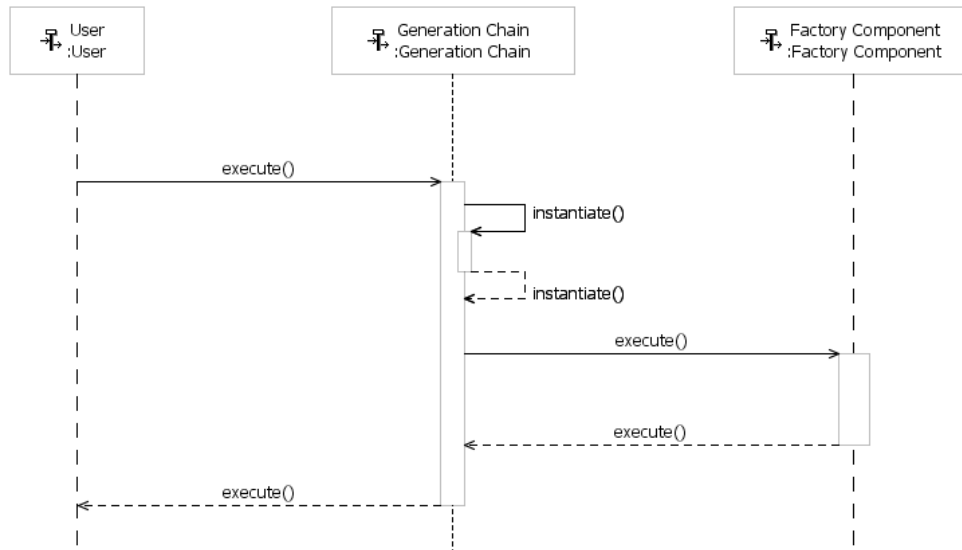*Figure 2. Instance of Generation Chain*

BEHAVIOR

Figure 3. Execution of Generation Chain

This sequence diagram depicts a typical sequence of generation chain execution:

- A user executes a generation chain
- The generation chain is transparently translated into factory components
- The generation chain executes the factory components

The translation phase realizes the following actions:

- MAPPING – Generation actions are transformed into factory components. The features determine the factory component parameters but also its structure. For instance, in Emf, the editor option determines whether there is an invocation to the Emf editor generator.
- DEFINITION OF THE ENVIRONMENT – Before the factory component execution, the environment must be setup. For instance, in Emf, the genmodel files which do not exist are automatically created. The user can change them later.

The user can decide to just instantiate the generation chain, without execute, in order to validate the environment setup.
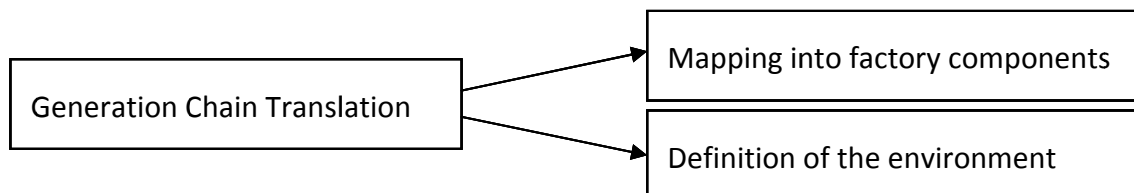

Figure 4. Translation of Generation Chain

PROCESS

The section presents the process dimension from the designer and developer viewpoints.
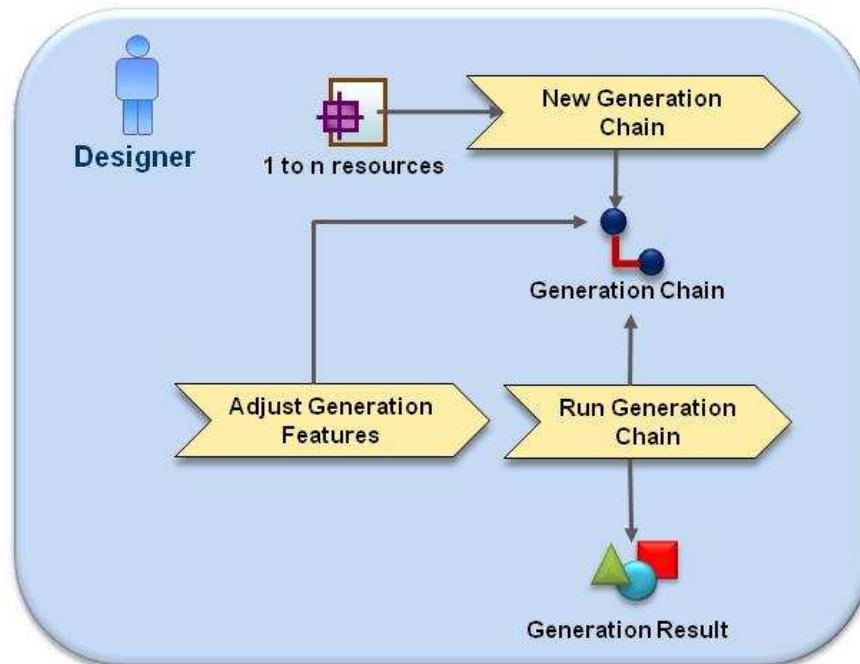
Designer viewpoint

Figure 5. Process – Designer Viewpoint

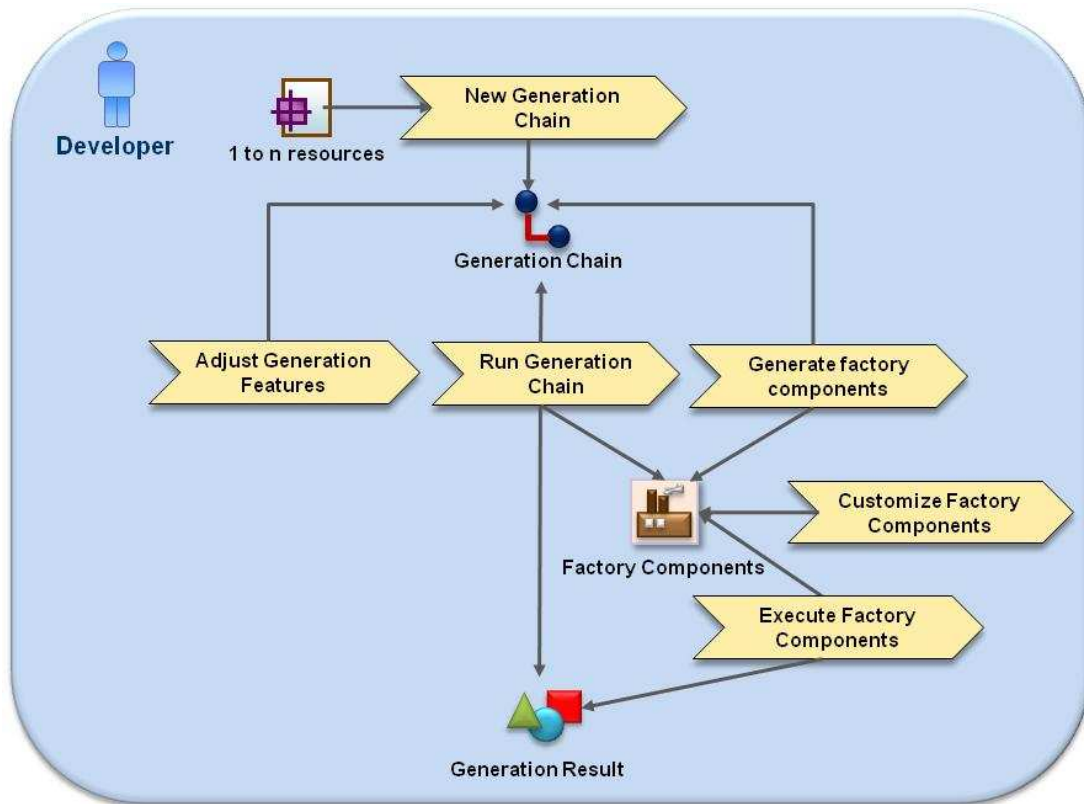| *New Generation Chain*	The Designer selects a set of models and launches the creation wizard of generation chain. For each model, the designer selects the generation actions and sets the generation features. After validation, the generation chain is created. The environment is set up.
Adjust Generation Features	At any time, the Designer can edit the generation and modify the generation features. For instance, he activates/deactivates the model editor generation.
Run Generation Chain	The designer executes the generation chain. The expected artifacts are produced.

Table 1. Designer activities

Developer viewpoint

Figure 6. Process – Developer Viewpoint

New Generation Chain	Like the Designer. The Developer can adjust technical details after the environment was setup. Example in Emf: the genmodel files which do not exist are created during this setup; then, the Developer can modify them in order to correctly set the Emf generation.
Adjust Generation Features	Like the Designer.
Run Generation Chain	Like the Designer.
Generate Factory Components	The Developer manually instantiates the generation chain into factory components. Next, he can customize those factory components.
Customize Factory Components	Cf. next section about this topic.
Execute Factory Components	When the factory components are instantiated, the generation can be launched from the generation chain or directly in this case from the factory components.

Table 2. Designer activities

CUSTOMIZATION OF A GENERATION CHAIN

Factory components from a portfolio define a standard type of generation on a given topic, such as the Emf generation. However, a main concern from projects is to customize a standard generation according to specific requirements. The issue is: how to customize a generation defined by a generation chain? A generation chain describes a generation at high level of description, while the need is to accurately adapt a generation, down to fine implementation details.
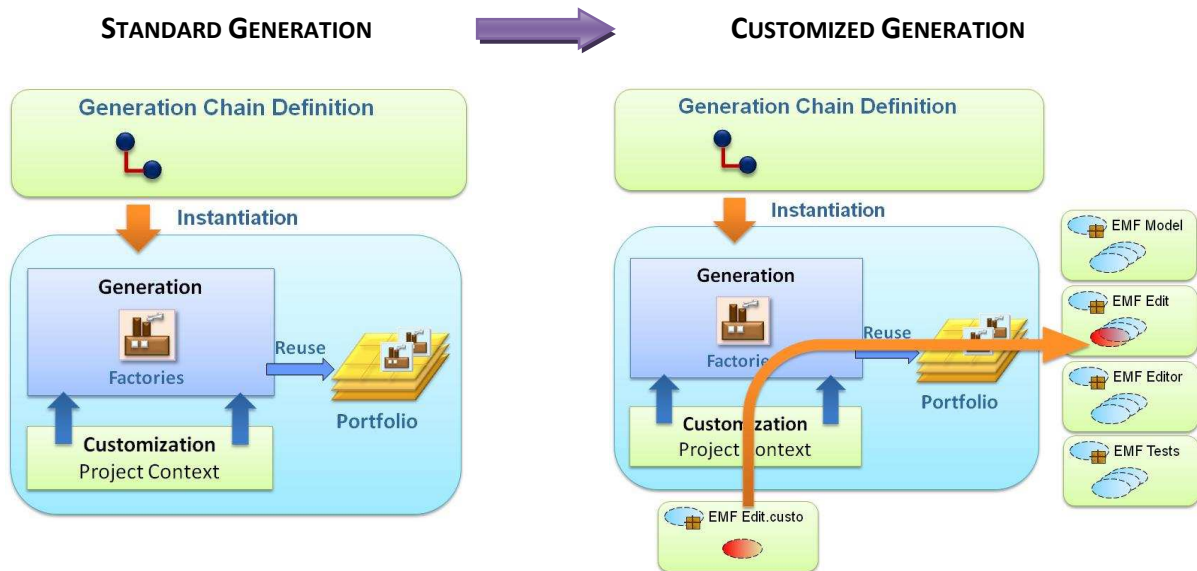

Figure 7. Generation Customization with a Generation Chain

The resolution is to customize the generation with patterns. EGF has reversed the Emf generation into EGF patterns. A mechanism of substitution enables to substitute a pattern by a set of patterns (any or several). In the project context, the standard patterns are replaced by patterns for customization. As depicted in the figure above, a part of the standard Emf edit generation is substituted by a specific Emf edit generation.

CONTRIBUTION TO THE LIST OF GENERATION ACTIONS

The list of generation action is open to contributions. For instance, the Emf generation can be enriched with new generation topics, such as the Java Doc.
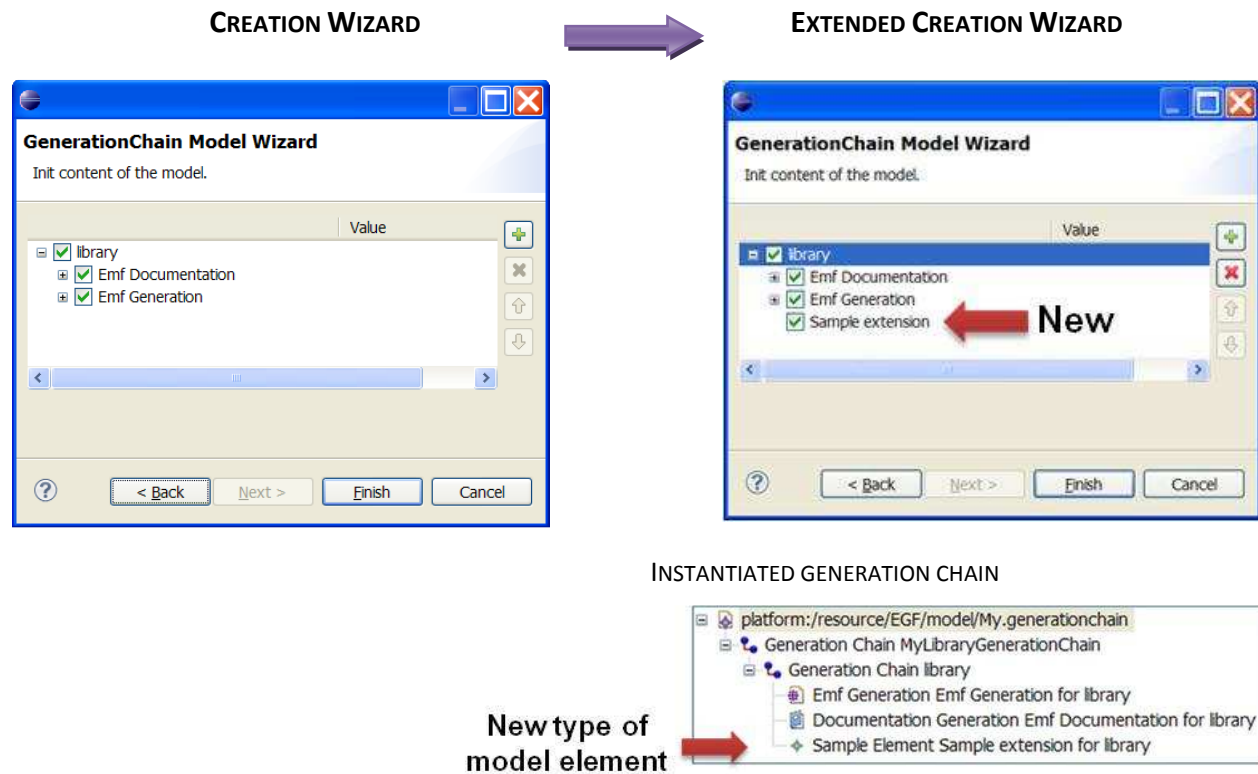
CREATION WIZARD   **EXTENDED CREATION WIZARD**

INSTANTIATED GENERATION CHAIN

Figure 8. Generation Customization with a Generation Chain

The figure above depicts an added "Sample extension" in the creation wizard of generation chain. After creation, the instantiated generation chain contains a new type of generation action with "Sample extension" property values.