Configurable Process Modeling

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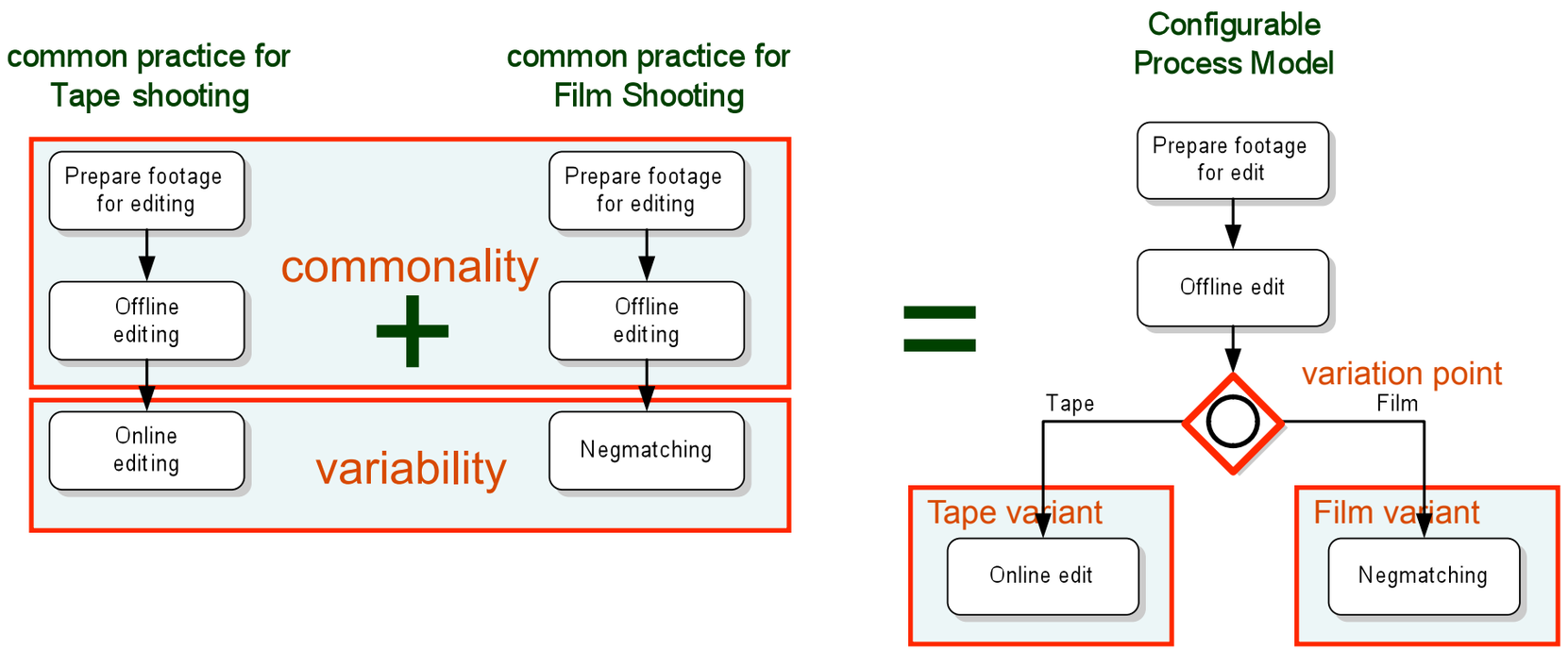
Configurable process model

Integrated representation of multiple variants of a same process in a given domain, which can be configured for a specific setting, leading to an individualized process model.



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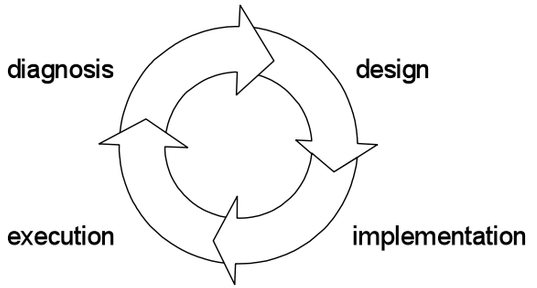
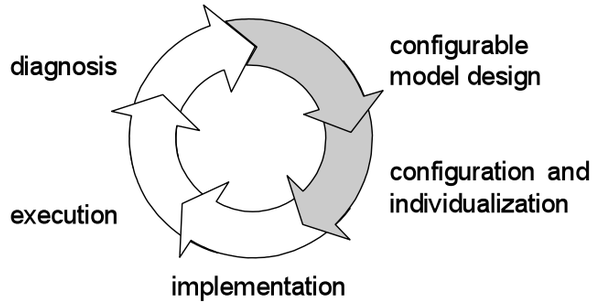
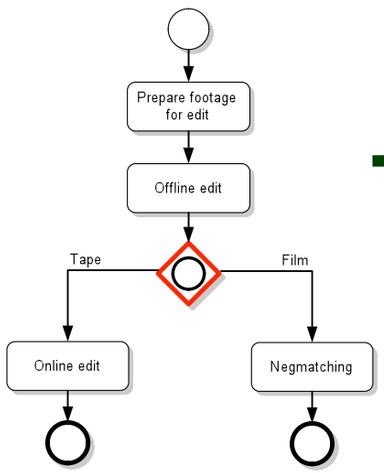
Configurable process models in the process lifecycle

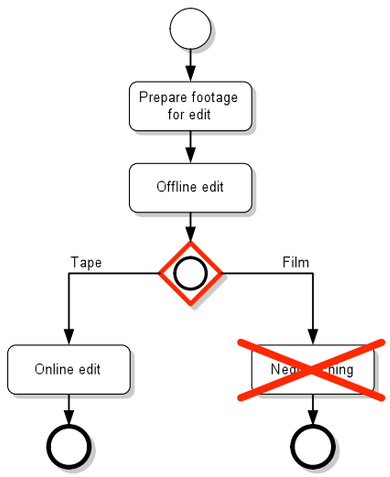




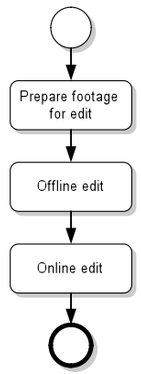
Configurable process model



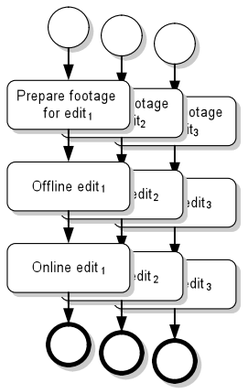
Configured process model (Tape shooting)



Derived model (Tape shooting)



Derived instances (Tape shooting)



design configuration individualization implementation execution

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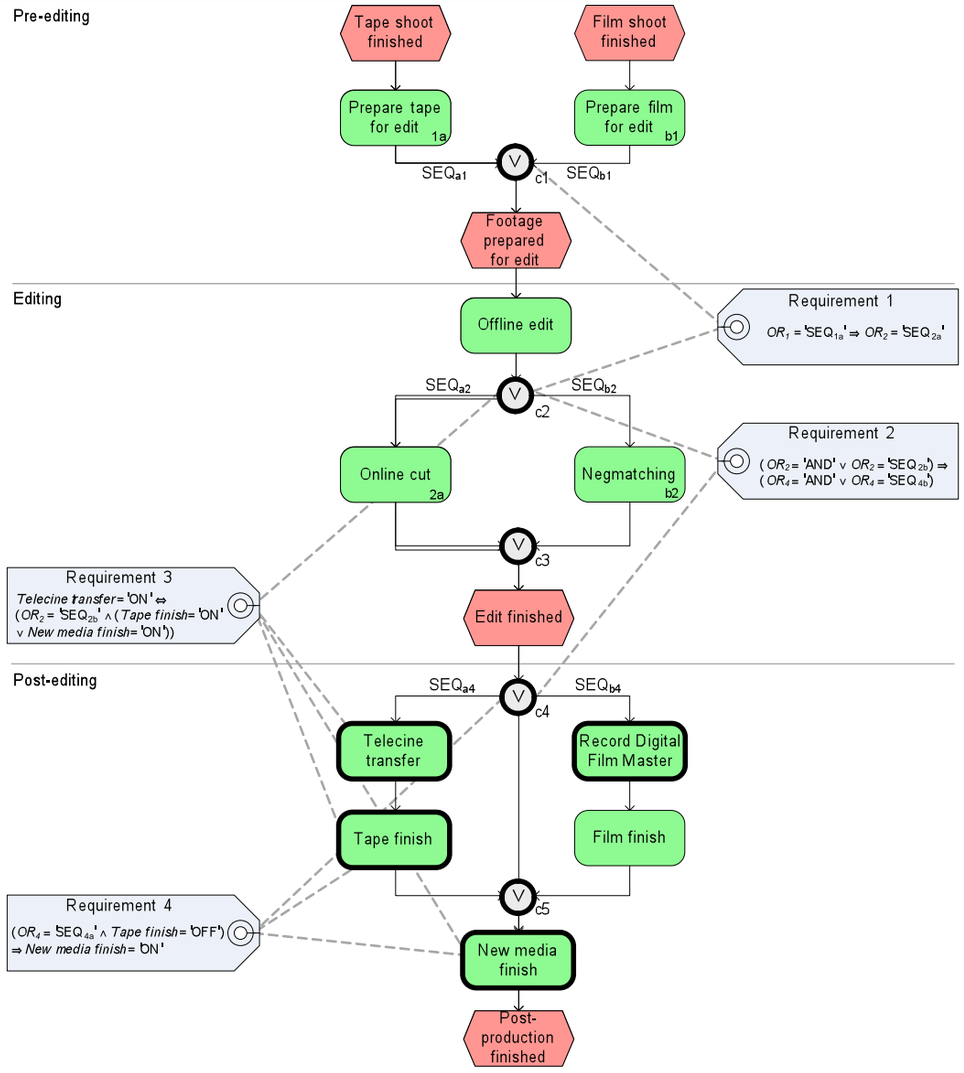
C-EPCs: a notation for configurable process models



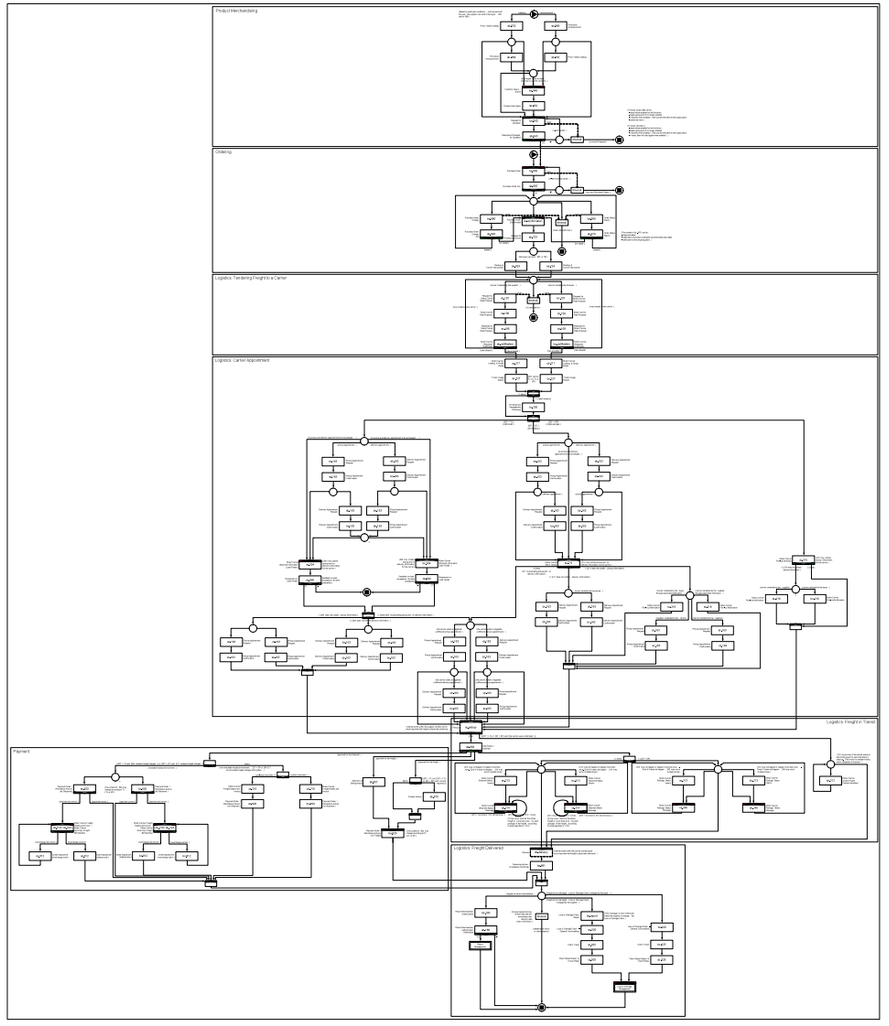
- Variation points are highlighted in the model.
- Requirements reduce the configuration space.

- **9** variation points
- over **1,200** possible configurations

A more complex example…

VICS Reference Model

- **50** variation points,
- **186,000** possible configurations.



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Lack of decision support

- Configuring a process model can be difficult and time-consuming, due to:
  - size of the variability space,
  - complexity of the domain.

- Domain experts usually have little or no knowledge about modeling notations (e.g. in the screen business).

- Need to facilitate the configuration of process models by domain experts, without requiring process modeling knowledge.

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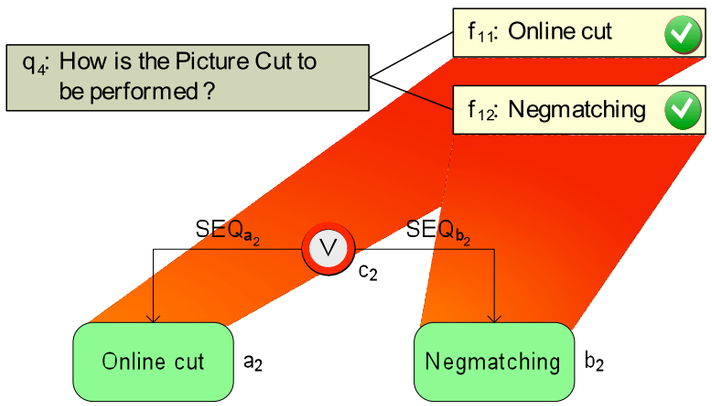
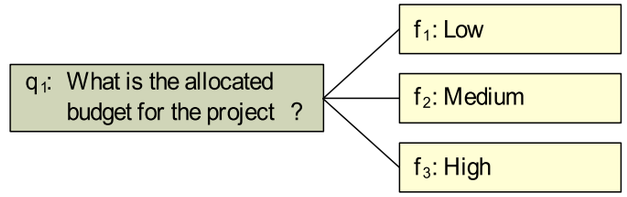
Questionnaire-based approach

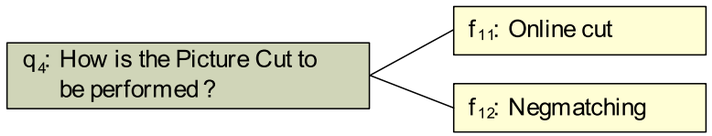
- Configuration can be simplified if carried out by answering a set of questions ➡ *no need to be aware of modeling notations.*
- The basic concepts of the approach are questions and domain facts:
  - a ***question*** is composed of a set of domain facts;
  - a ***domain fact*** encodes a business choice and can be set to “true” or “false”.
- Variation points in the process model are mapped to boolean expressions over domain facts.
- Questions may affect one or multiple variation points:





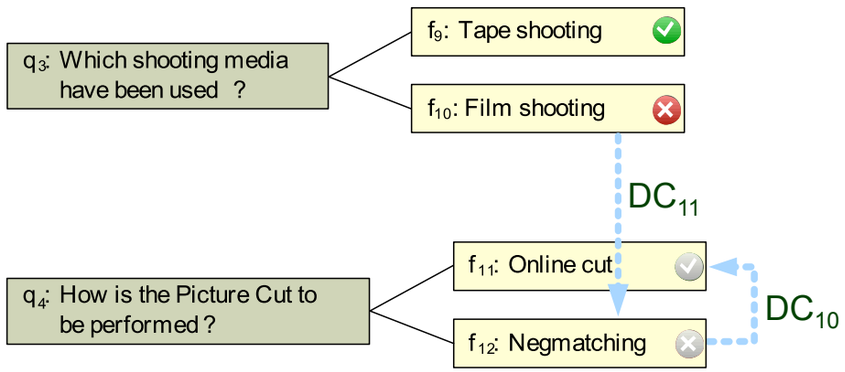
Domain constraints

- The configuration space of the domain is restricted by a set of propositional logic ***domain constraints*** over the domain facts.



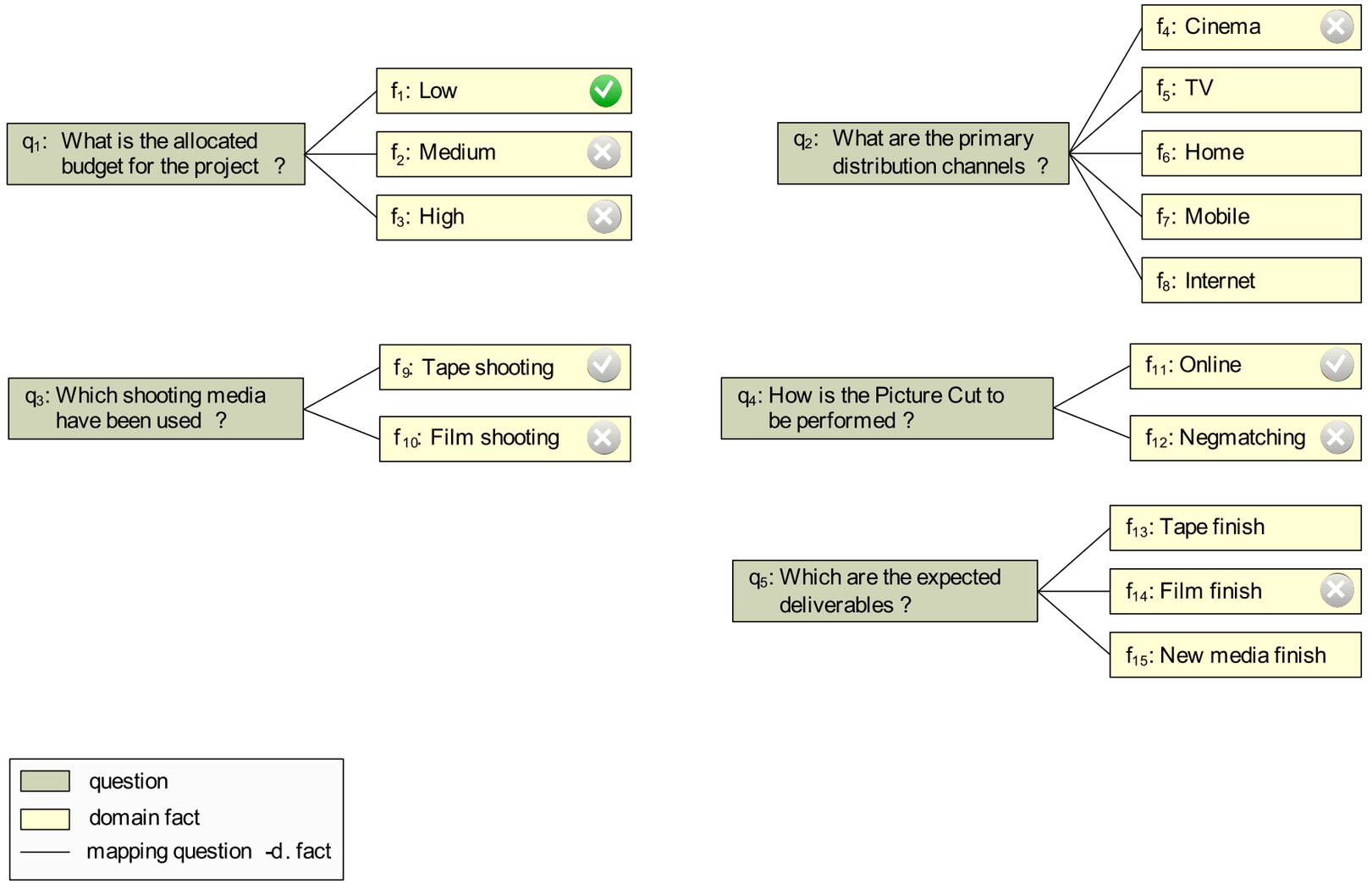
DC_{10}: f_{11} v f_{12}

- By means of domain constraints, answers to questions may be determined by previous answers.



DC_{11}: ¬ f_{10} ⇒ ¬f_{12}

Questionnaire model



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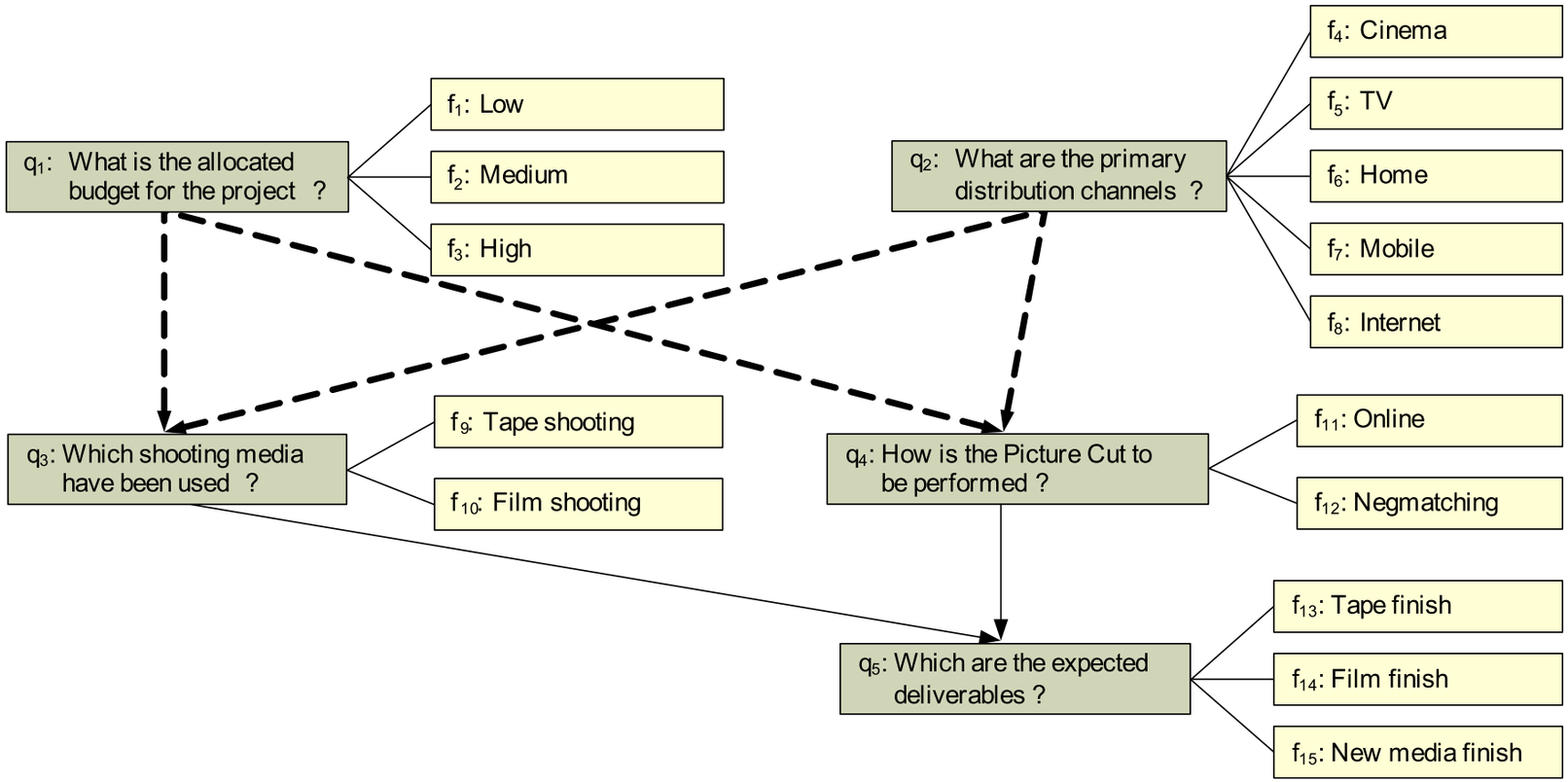
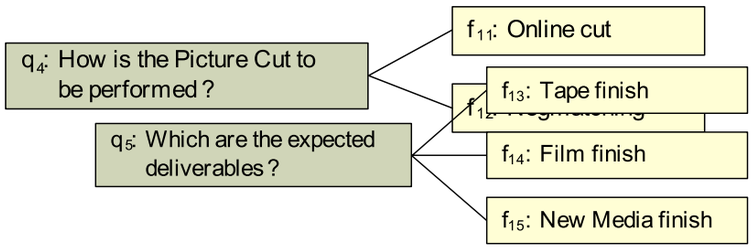
Order dependencies

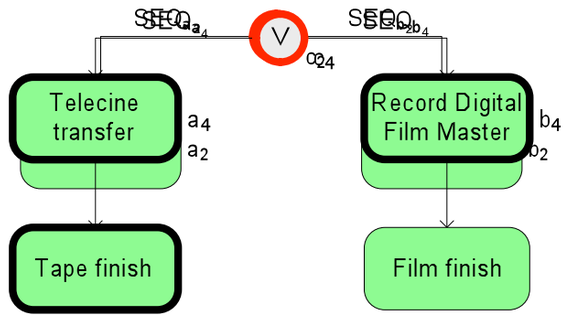


Mapping process models to questionnaire models

Questionnaire Model



Process Model



Mapping

MC_6: $p^{c_2}_{SEQ_{a_2}} \Leftrightarrow \neg f_{12}$

MC_7: $p^{c_2}_{SEQ_{b_2}} \Leftrightarrow \neg f_{11}$

MC_8: $p^{c_2}_{AND} \Leftrightarrow f_{11} \wedge f_{12}$

MC_9: $p^{c_2}_{OR} \Leftrightarrow$ false

MC_{10}: $p^{c_2}_{XOR} \Leftrightarrow$ false

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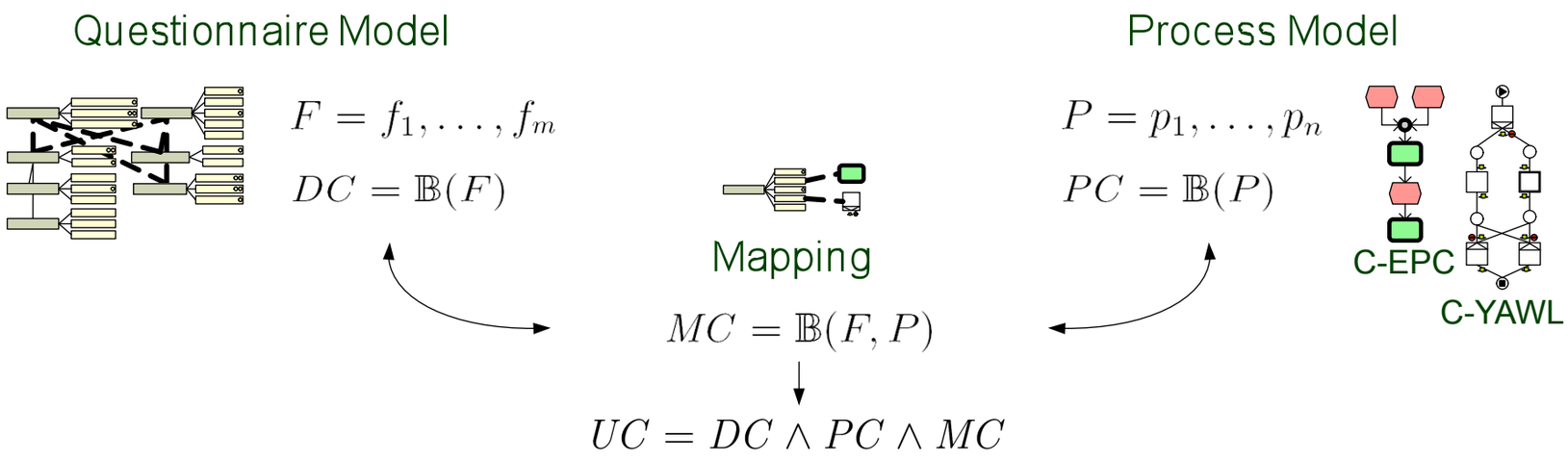
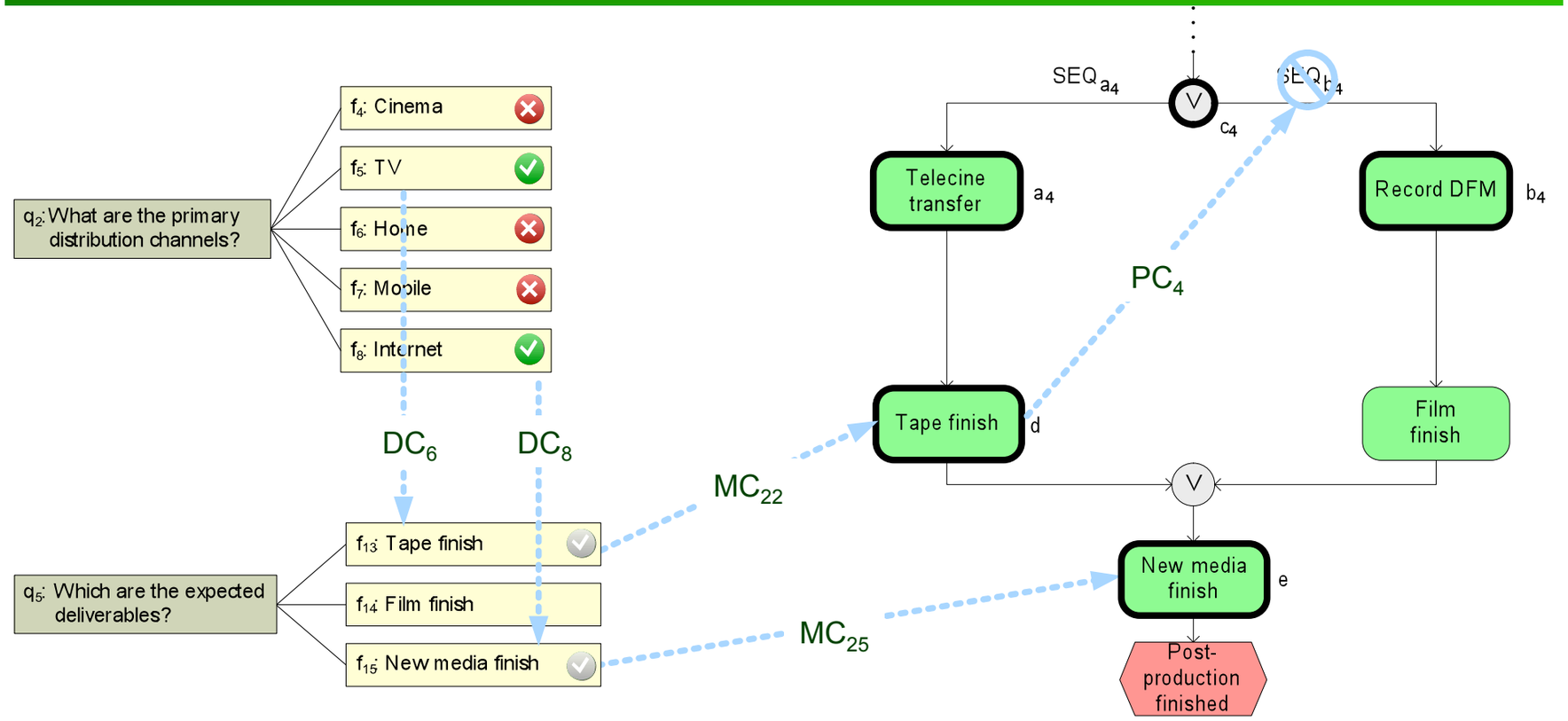
Mapping process models to questionnaire models

A ***mapping*** links process facts to domain facts:



The mapping ensures domain compliance and process model correctness.

Constraints in action



Domain constraints

DC_6: $f_5 \Rightarrow f_{13}$

DC_8: $f_8 \Rightarrow f_{15}$

Mapping

MC_{22}: $p^d_{ON} \Leftrightarrow f_{13}$

MC_{25}: $p^e_{ON} \Leftrightarrow f_{15}$

Process constraints

PC_4: $p^d_{ON} \Rightarrow \neg p^{c_4}_{SEQ_{b_4}}$

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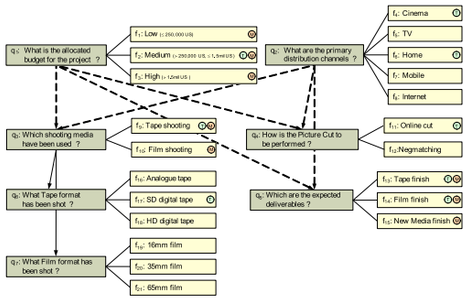
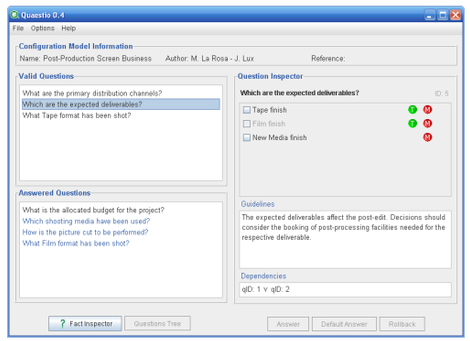
Application of the approach

Questionnaire model



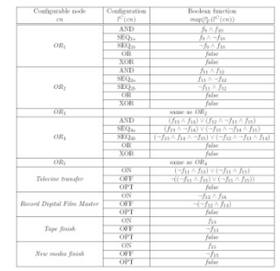
input to



Interactive Questionnaire

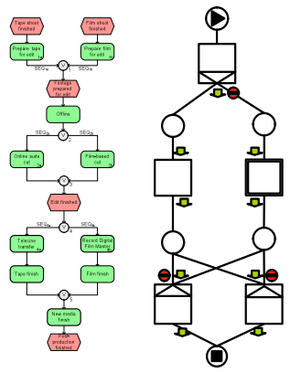
answers

Mapping



Configurable node cn	Configuration $f^{\circ}(cn)$	Boolean function $map(\mathcal{F}_i(f^{\circ}(cn)))$
OR_1	AND	$f_9 \wedge f_{10}$
	SEQ_{1n}	$f_9 \wedge \neg f_{10}$
	SEQ_{2n}	$\neg f_9 \wedge f_{10}$
	OR	*false*
	XOR	*false*
OR_2	AND	$f_{11} \wedge f_{12}$
	SEQ_{1n}	$f_{11} \wedge \neg f_{12}$
	SEQ_{2n}	$\neg f_{11} \wedge f_{12}$
	OR	*false*
	XOR	*false*
OR_3		same as OR_2
OR_4	AND	$(f_{13} \wedge f_{14}) \vee (f_{13} \wedge \neg f_{13} \wedge f_{15})$
	SEQ_{1n}	$(f_{13} \wedge \neg f_{14}) \vee (\neg f_{13} \wedge \neg f_{14} \wedge f_{15})$
	SEQ_{2n}	$(\neg f_{13} \wedge f_{14} \wedge \neg f_{15}) \vee (\neg f_{13} \wedge \neg f_{14} \wedge f_{15})$
	OR	*false*
	XOR	*false*
OR_5		same as OR_4
Telecine transfer	ON	$(\neg f_{11} \wedge f_{12}) \vee (\neg f_{11} \wedge f_{13})$
	OFF	$\neg((\neg f_{11} \wedge f_{12}) \vee (\neg f_{11} \wedge f_{13}))$
	OPT	*false*
Record Digital Film Master	ON	$\neg f_{12} \wedge f_{14}$
	OFF	$\neg(\neg f_{12} \wedge f_{14})$
	OPT	*false*
Tape finish	ON	f_{13}
	OFF	$\neg f_{13}$
	OPT	*false*
New media finish	ON	f_{15}
	OFF	$\neg f_{15}$
	OPT	*false*

+



Configurable Process Model

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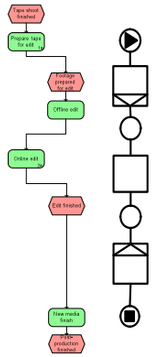
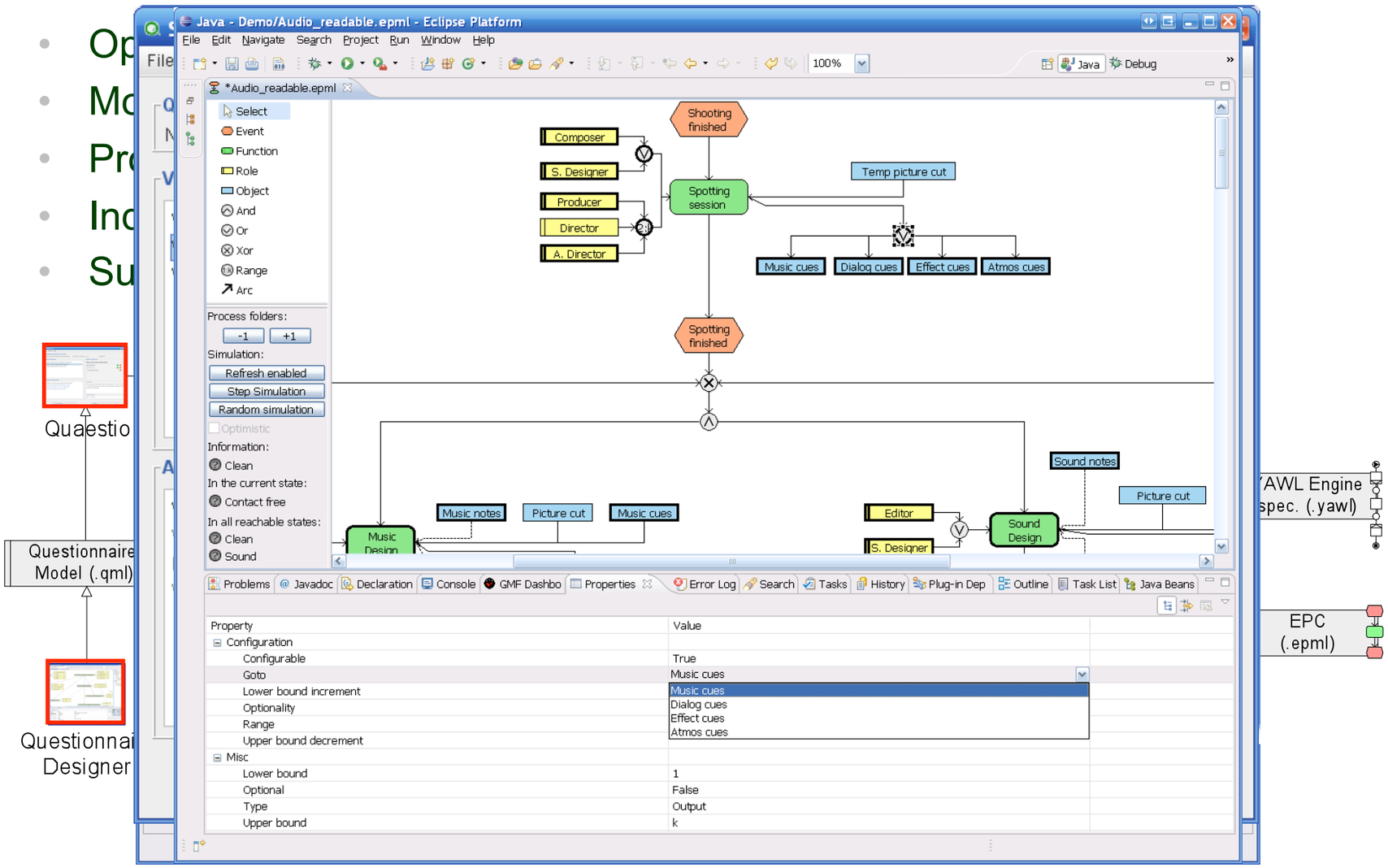


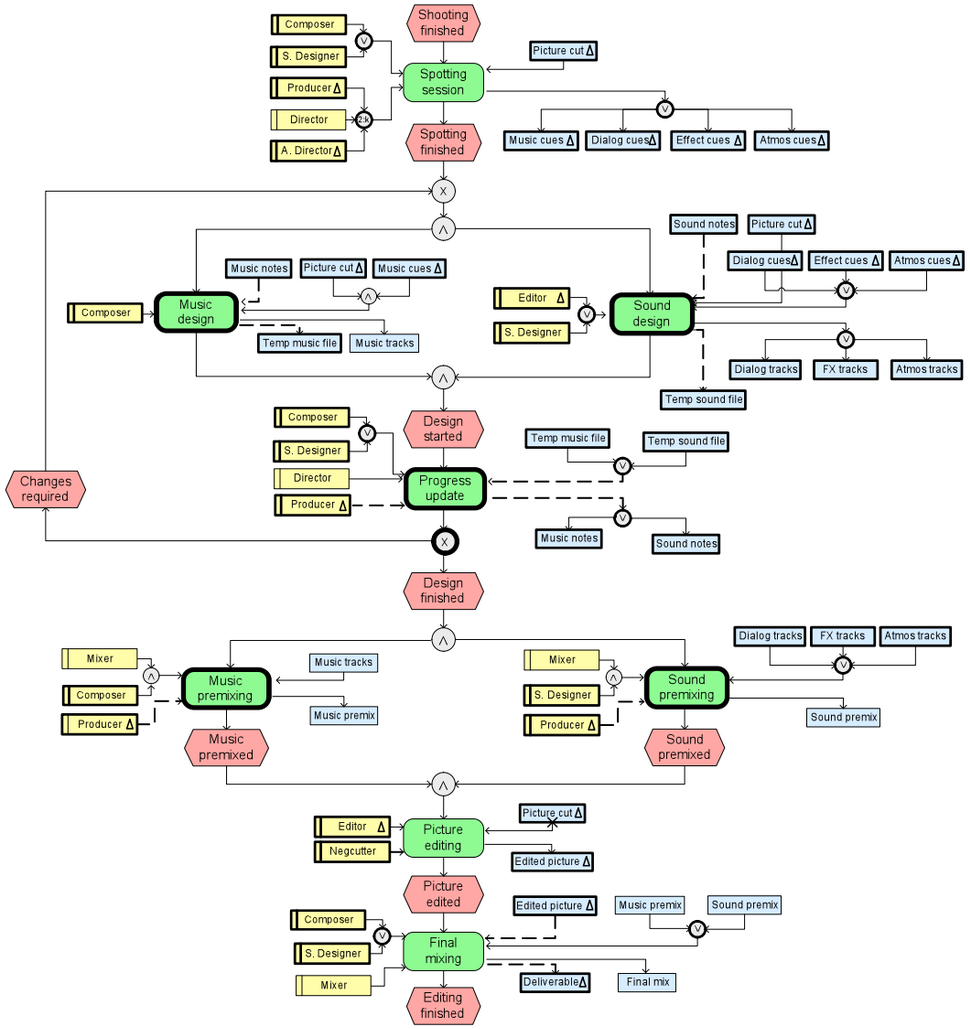
Individualized Model

The Synergia toolset

- Op
- Mo
- Pr
- Inc
- Su



A configurable ‘reference’ model for Post-production



- Construction and validation of the model with domain experts from the AFTRS

- **792** process elements
- **183** variation points (23%)
- over **310,000** process configurations

- **3** sub-questionnaires
- **1** introductory questionnaire
- **53** questions
- **162** domain facts

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What from now?

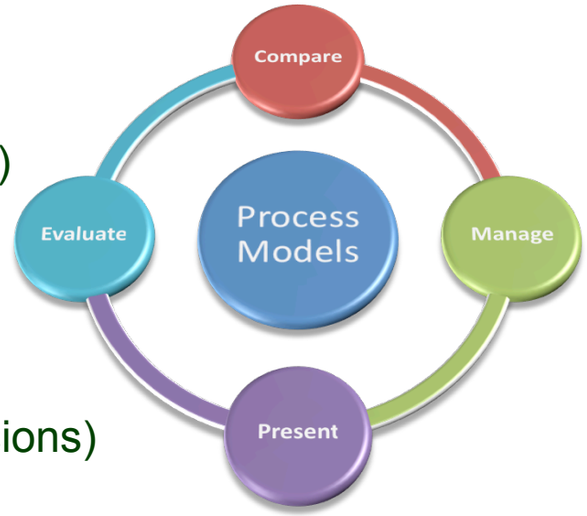
i.e., how to achieve large scale adoption?

1. Improve toolset usability
   - build upon initial results obtained through experiments conducted at AFTRS and Dutch municipalities
2. Generate content
   - translate industry reference models into configurable models
   - automate the creation of configurable models via merge techniques
3. Investigate relation with large process collections
   - design and develop an advanced process model repository

AProMoRe: Advanced Process Model Repository

- Evaluation

  establish adherence to various quality notions
  (e.g. correctness criteria, benchmarking frameworks)



- Comparison

  search for similarities
  (e.g. conformance to reference models, track extensions)

- Management

  control the creation and evolution of process models
  (e.g. via configuration, merging, improvement)

- Presentation

  improve the understanding of process models
  (e.g. contextualization via abstraction and colouring mechanisms)

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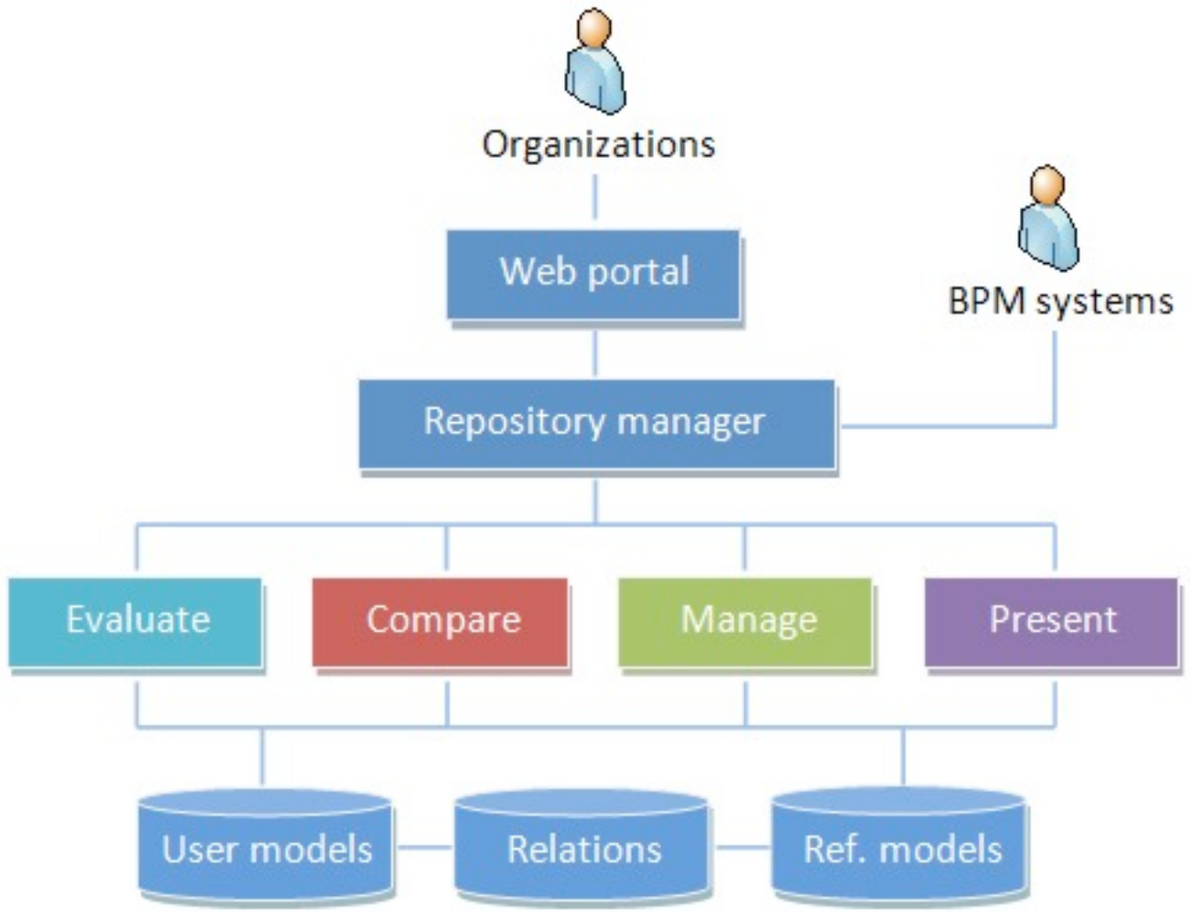
AProMoRe - Architecture



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Canonical format: the power of losing

Common process representation as **directed attributed graph**:

1. *Standardization*: cross-language operations can be performed directly and concatenated

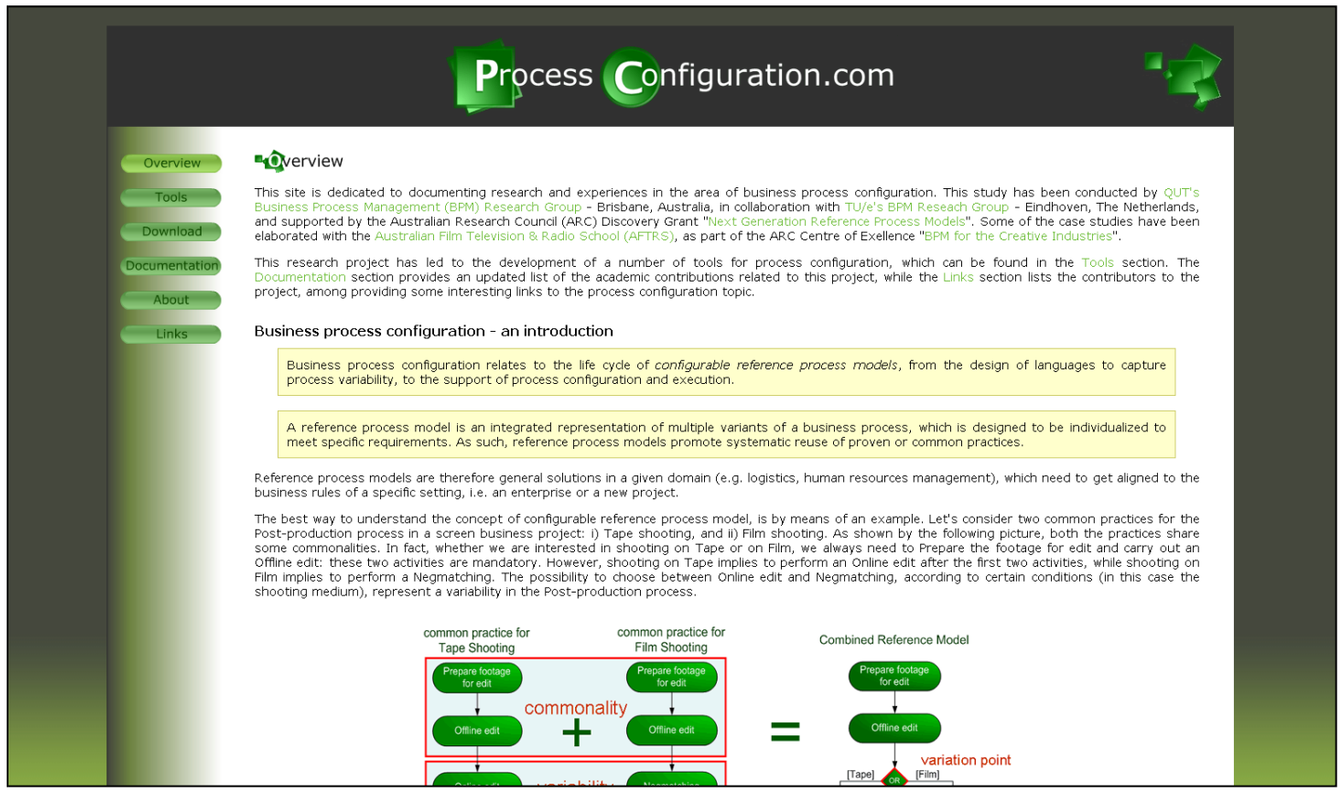
2. *Efficiency*: no language conversions -> faster operations, e.g. Searches and comparisons

3. *Interchangeability*: non structural aspects captured by meta-data -> swap notations or semantics at (almost) no cost

4. *Flexibility*: inheritance mechanism -> different algorithms can work at different abstraction levels

For more information…

…visit www.processconfiguration.com



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