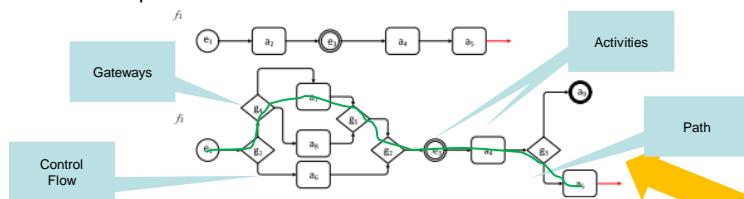# Matrices-Based Business Process Fragments Merge

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General Context & Motivations

- New processes design from scratch is time consuming and error prone
- Needs implementation, compilation, and optimization
- Redundant operations in existing business processes are already implemented, compiled, and optimized operations
- Retrieve and reuse relevant fragments from business processes
- Reduce development time and enhance robustness

Example of Business Process Fragments

- Retrieved fragments need to be merged to build new complete BPs
- Behavior inconsistency after the merge
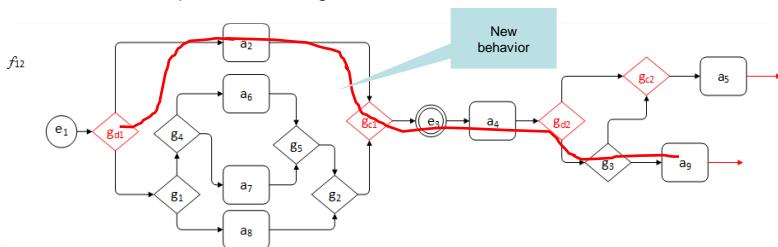
Merge of Process Fragments f_1 and f_2

Merging Fragment Adjacency Matrices: Steps

1. Merge elements having the same source and target
Correctness properties are broken
2. Apply correction rules on elements to generate the resulting FAM

① Merge FAM Elements

- When merging a couple of paths, each element from one path is merged with an element having the same position from the other path
  1. Both paths must have the same source and target activities
  2. At the same position, both paths must have the same gateway's type
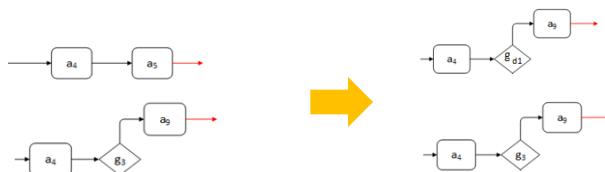
Element's Paths Alignment

Behavioral Constraint Annotation
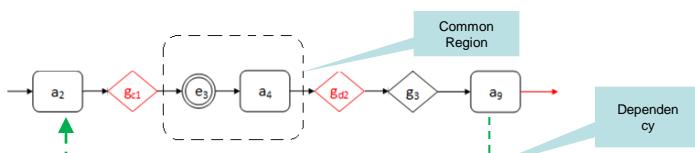
Dependency Between the Activities

Objectives

1. Provide consolidated fragment that is the merge of a set of relevant fragments
2. Keep the behavior of input fragments

Fragment Adjacency Matrix (FAM)

- A graph can be modeled with an adjacency matrix
- Illustrate the existence of edges between adjacent nodes
- Nodes = activities, Adjacent nodes = adjacent activities
- Elements = paths between adjacent activities

Fragment Adjacency Matrix M_{f_2} Corresponding to Fragment f_2

FAM Correctness Properties

1. An element containing a path of size 1 ➡ cannot contain other paths, and the rest of the elements of the row and the column are empty.
2. Several elements of a row are not empty ➡ the first control flow of each element paths is shared by all of them.
3. Several elements of a column are not empty ➡ the last control flow of each element paths should be shared by all of them.

② Apply Correction Rules

Matrix M Obtained from the Merge of Two Fragment Matrices

1. Elements of a row (resp. a column) whose paths do not share the first (resp. the last) control flow ➡ insert a divergence (resp. convergence) gateway between objects of the first (resp. last) control flow of each path
2. An element may contain several paths retrieved from several fragment matrices and do not share the first nor the last control flow ➡ insert a divergence and a convergence gateway between objects of the first and the last control flow of each path

Results

$\#act_1$	$\#act_2$	$\#CF_1$	$\#CF_2$	Merge Time(sec)
274	239	312	326	0,01
32	26	67	82	≈ 0
65	59	87	88	0.003
117	130	155	169	0.012

Results of the Merge Execution with Time Focus

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