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1 Definitions

As an internal data-structure, we define a business process as a process graph P= *(N,E,τ,γ)*, in which:

- N is the set of nodes;
- $E \subseteq N * N$ is the set of edges; and
- τ : N$\rightarrow \Gamma$ is a function that maps nodes to their types, knowing that Γ is defined as the set of types of nodes.
- γ is the set of temporal constraints labels of the process.

We note that $\gamma_{Rel}(N_i)$ (resp. $\gamma_{Abs}(N_i)$) denotes the relative (resp. absolute) temporal constraints of the node N_i.
Actually, Γ supports the following types of nodes : activities (Activity), events (i.e. Start Event(SE) and End Event(EE)) and gateways (i.e. sequence(SEQ), parallel(PAR), inclusive(INCL) and exclusive(EXCL)).

Let $N_i \in N$ be a node, we introduce some preliminary definitions related to the process:

- pre(N_j, P)=$\{N_i \in N \mid \exists\ (N_i, N_j) \in E\}$, denotes the predecessor nodes of N_j,
- postt(N_i, P)=$\{N_j \in N \mid \exists\ (N_i, N_j) \in E\}$, denotes the successor nodes of N_i,
- preActivity_set (N_j, P)=$\{N_i \in N \mid \exists\ (N_i, N_j) \in E \wedge \tau(N_i)$=A$\}$, denotes the activity nodes of the predecessor nodes of N_j, and
- postActivity_set (N_i, P)=$\{N_j \in N \mid \exists\ (N_i, N_j) \in E \wedge \tau(N_j)$=A$\}$, denotes the activity nodes of the successor nodes of N_i.

Meanwhile, for sake of simplicity, the proposed process graph helps to define the following elementary functions :

- parent-node (N_i, P) is a function that maps a node N_i to its parent node,
- child-node (N_i, P) is a function that maps a given node N_i to a node N_j such that : if N_i is in a sequential flow, the returned node N_j denotes the first node of the sequence. If the node N_i belongs to a gateway (i.e. PAR, INCL or EXCL) the different nested nodes (gateways or activities) are returned.
- next-node (N_i, P) is a function used only to add an order to the children of a node sequence(SEQ). In other words, this function points to the next node of the sequential flow.