

# Dynamic Skipping and Blocking and Dead Path Elimination for Cyclic Workflows (Extended Abstract))<sup>3</sup>

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**Abstract:** We propose and study dynamic versions of the classical flexibility constructs skip and block and motivate and define a formal semantics for them. We show that our semantics for dynamic blocking is a generalization of classical dead-path-elimination and solves the long-standing open problem to define dead-path elimination for cyclic workflows. This gives rise to a simple and fully local semantics for inclusive gateways. The work summarized in this extended abstract has been published in [FV16].

**Keywords:** Process modeling, process modeling languages, BPMN, process flexibility by design, dead path elimination, inclusive gateway semantics, skipping and blocking

## 1 Problem Description

One of the challenges in process management is striking a balance between the clarity of a process model on one hand and its ability to support a large variety of process flows on the other hand (also called process flexibility). A model can express flexibility in different ways: by design, by deviation, by underspecification, and by change [Ro17; RW12]. Flexibility *by design* faces the above challenge directly: including many different possible paths in a model tends to increase its complexity.

The classical concepts to *skip* tasks and to *block* a path can be used to express flexibility by design. They have been used predominantly for *static* flexibility, i.e., to remove tasks or paths from the model *before* deployment through process model configuration [Go08]. However, in many processes, skipping and blocking dynamically depend on user input or dynamically computed data. WS-BPEL uses *dynamic* skipping and blocking for *dead path elimination* [LA94], but is limited to acyclic control-flow graphs and merges deliberate task skipping (by process logic) with enforced task blocking (due to activity failure). This prevents the free combination of these concepts and can create unintended side effects [BK05].

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<sup>3</sup> This article summarizes problem, approach, and selected findings of a study published as *Dirk Fahland, Hagen Völzer: Dynamic Skipping and Blocking and Dead Path Elimination for Cyclic Workflows. BPM 2016: 234-251 (2016) doi:10.1007/978-3-319-45348-4\_14* [FV16]



In this paper, we study freely combinable concepts for dynamic skipping and blocking in arbitrary process models in the context of BPMN.

## 2 Results

We define dynamic skipping and blocking for BPMN-like languages, each with a dedicated local semantics, such that they can be used independently from each other or freely combined. We define the semantics for general control-flow graphs, including cyclic graphs, and compare the semantics of static and dynamic skipping and blocking.

Our proposal for dynamic blocking includes a generalization of the Dead-Path-Elimination (DPE) concept [LA94] to general control flow, which so far was limited to acyclic control flow. We point out that dynamic blocking is closely related with the semantics of inclusive gateways (aka synchronizing merge pattern, OR-join semantics).

Our generalization of DPE to cyclic flow graphs gives rise to a purely local semantics for inclusive join behavior. As a result, our semantics does not entail semantic anomalies such as ‘vicious cycles’ (see, e.g. [Ki06]). In comparison with existing semantics, it can be enacted faster, i.e., in constant time, it is compositional for more models and therefore easier to understand and use, and it permits more refactoring operations for process models.

## References

- [BK05] van Breugel, F.; Koshkina, M.: Dead-Path-Elimination in BPEL4WS. In: ACSD 2005. IEEE Computer Society, pp. 192–201, 2005.
- [FV16] Fahland, D.; Völzer, H.: Dynamic Skipping and Blocking and Dead Path Elimination for Cyclic Workflows. In: BPM 2016. Vol. 9850, Springer, pp. 234–251, 2016.
- [Go08] Gottschalk, F.; van der Aalst, W. M. P.; Jansen-Vullers, M. H.; Rosa, M. L.: Configurable Workflow Models. *Int. J. Cooperative Inf. Syst.* 17/2, pp. 177–221, 2008.
- [Ki06] Kindler, E.: On the semantics of EPCs: Resolving the vicious circle. *Data Knowl. Eng.* 56/1, pp. 23–40, 2006.
- [LA94] Leymann, F.; Altenhuber, W.: Managing Business Processes as an Information Resource. *IBM Systems Journal* 33/2, pp. 326–348, 1994.
- [Ro17] Rosa, M. L.; van der Aalst, W. M. P.; Dumas, M.; Milani, F.: Business Process Variability Modeling: A Survey. *ACM Comput. Surv.* 50/1, 2:1–2:45, 2017.
- [RW12] Reichert, M.; Weber, B.: Enabling Flexibility in Process-Aware Information Systems - Challenges, Methods, Technologies. Springer, 2012.