

Modelling Complex Events with Event-Driven Process Chains

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Abstract: The emerging technology complex event processing can be utilized to integrate complex events into business processes and to flexibly adjust processes on changing business requirements. Due to the complexity of events to be modelled, a high interaction level between users and developers is required. The lack of appropriate approaches for modelling complex events with the common conceptual modelling languages hampers this interaction. Here an approach for modelling complex events in business processes using event diagrams and event-driven process chains is proposed.

Keywords: Conceptual Modelling, Complex Events, Event-Driven Process Chain

1 Introduction and Related Work

For the (re-)engineering of business processes the utilization of conceptual process models is common and a number of different modelling languages for their design exist. Conceptual modelling languages aim to improve the communication between users and developers and therefore have a graphical notation. Here, Event-Driven Process Chains (EPCs) are used for this purpose [KNS92]. While activities within an EPC-model are depicted as functions, the passive elements which describe the state before and after a function are depicted as events. Events and functions are always arranged in an alternating order and mutually connected with control flow arcs. Furthermore, logical connectors (AND, OR, XOR) can be used to split or merge the control flow. Even though functions within a business process are mostly triggered by simple events the triggering event can also be a so-called complex event. A complex event is caused by a set of simple events or other complex events [Lu02].

To assure that the concepts of *relationships between events (time, causality, aggregation)* and *hierarchies of events* of the technology Complex Event Processing (CEP) [Lu02] can be used to integrate complex events into process models, the common modelling languages have to support the modelling of complex events (cf. [DGB07] for an extension of Business Process Modelling Notation (BPMN) for this purpose). The contribution made by this paper is to introduce the modelling of complex events with event diagrams and decision tables (Section 2) and to demonstrate how modelled complex events can be used to link different EPC-models (Section 3).

2 Modelling Complex Events with Event Diagrams

In order to model a business process it is recommended to specify events in a top-down manner. After refinement of events, event diagrams can be utilized to show the specialized abstraction relationship between the coarse-grained event and its subevents. The logical connectors introduced in section 1 can be used to connect events in event diagrams. In the following event diagrams are applied to model complex events. It is emphasised that the relationship between the complex events and the belonging simple events is an aggregation relationship (part-of).

An example for a complex event is the detection of a possible identity theft in a credit card company. The complex event *possible identity theft* is triggered when a customer changes the password for a credit card account and this change is followed by a large (and therefore suspicious) request within 24 hours. In fig. 1 this complex event is depicted in an event diagram. The events are connected with an AND-Operator because both simple events have to happen to trigger the complex events. The event *large request* is drawn offset to express that this event has to happen after the event *password changed* [Ro96]. However, the fact that the complex event is triggered only in case the event *large request* happens within 24 hours after the event *password changed* is difficult to model with event diagrams.

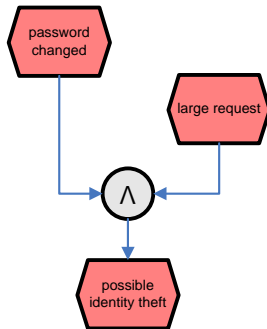


Fig. 1: Event Diagram

	R1	R2	R3	R4
Large request	Y	Y	Y	Y
Password changed	Y	Y	N	N
$T_{\text{password changed}} - T_{\text{large request}} < 1 \text{ day}$	Y	N	Y	N
Possible identity theft	x			
No identity theft		x	x	x

Table 1: Decision Table

[Ro96] introduced the Decision Table (DT)-operator as an extension to EPCs for capturing more complex relationships between events and functions. Decision tables are a common method to model decision logic and can be divided into four quadrants: In the left and right upper quadrant the conditions respectively the corresponding condition alternatives (Y = Yes, N = No) are depicted. In the left and right lower quadrant the resulting actions respectively action entries are modelled. The conditions are usually connected with a logical AND, the actions are connected with a XOR-Operator.

In this paper the DT-operator is introduced to model complex relationships between events in event diagrams. The simple events are modeled as conditions and the complex events as actions. To describe the complex event *possible identity theft* more exactly, the AND-Operator in fig. 1 is replaced by a DT-Operator. The corresponding shorted decision table for the event diagram is depicted in table 1.

3 Integration of Complex Events and EPC-Models

In this Section it is demonstrated how a modelled complex event can be used to link different EPC-models. In contrast to the proposal of [GS05] the event diagram is used to connect processes on different levels. The process on the semantically higher level contains the complex event(s) which is (are) triggered by the mentioned simple events. In fig. 2 two independent processes are modelled on the lower level. The resulting events of these processes are the known simple events from section 1. The extended event diagram in fig. 2 is utilized to trigger complex events in a hierarchical superior process on level 2.

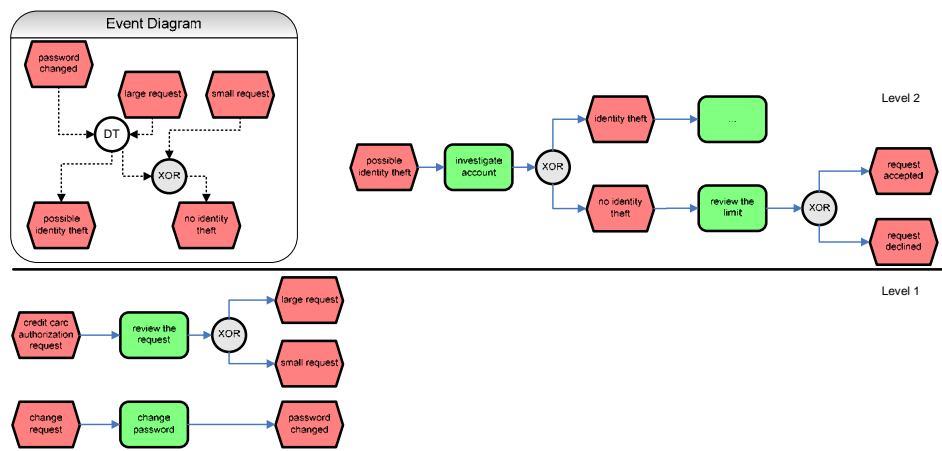


Fig. 2: Processes of the possible identity theft

It is mentioned that the processes could also be modeled in one (large) EPC-model, though the presented approach has the advantage that complex events can be modeled explicitly and a higher flexibility is achieved.

References

- [DGB07] Decker, G.; Grosskopf, A.; Barros, A.: A Graphical Notation for Modeling Complex Events in Business Processes. In: IEEE Computer Society (ed.): Proceedings of the 11th International Conference on Enterprise Distributed Object Computing Conference (EDOC 2007). Anapolis, 2007, p. 27 – 36.
- [GS05] Grief, J.; Seidlmeier, H.: Modellierung von Flexibilität mit Ereignisgesteuerten Prozessketten (EPK). In: Nüttgens, M.; Rump, F. (eds.): EPK 2005 - Geschäftsprozessmanagement mit Ereignisgesteuerten Prozessketten, Hamburg, 2005, S. 137 – 155.
- [KNS92] Keller, G.; Nüttgens, M.; Scheer, A.-W.: Semantische Prozessmodellierung auf der Grundlage „Ereignisgesteuerter Prozessketten (EPK)“. In: Scheer, A.-W. (Hrsg.): Veröffentlichungen des Instituts für Wirtschaftsinformatik. Saarbrücken, 1992.
- [Lu02] Luckham, D.: The Power of Events. Addison-Wesley, Boston & Massachusetts, 2002.
- [Ro96] Rosemann, M.: Komplexitätsmanagement in Prozessmodellen. Wiesbaden, Gabler, 1996.