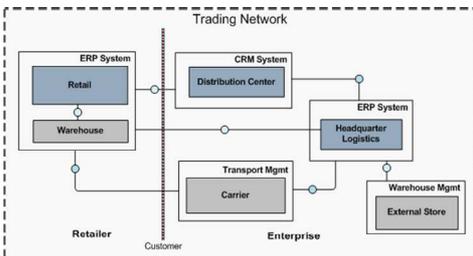# Modeling Approach for Business Networks with an Integration and Business Perspective

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Abstract

Business Network Management (BNM) allows enterprises to manage their application integration and trading/ partner networks by making technical integration, business and social aspects visible within a network view and set them into context to each other. This allows various personas, like business user, integration expert and IT support, to analyze, operate and develop business processes by collaborating on these contexts. Defining a model sufficient to represent the BNM domain with different layers of abstraction, from business to technical views and perspectives of network-structured data requires a standard, human- and machine readable notation. Modeling of real-world technical and business artifacts is widely addressed by special purpose models which cover parts of these requirements for BNM. However, none of them accounts for the combined business, technical and social nature of most enterprises, nor of the semantic network and data linking aspects. We present design decisions and design for a model based on BPMN, that is sufficient for BNM and represents inter-related business and technical perspectives within and across enterprise networks.

Design Principles

In our approach, the model for business network serves as **visual representation** and **standardized exchange format** for real-world entities like applications and **semantically relates the context** end-to-end, e.g. from process to system. For that, a **human and computer readable** notation is required. This notation shall be a well established standard which covers the requirements for defining entities, their relationships and properties representing the business network. A **"one-model" approach** shall be followed, to allow **views on business and technical aspects**, and enable **all personas to work with the same model**. The semantic model for the business network shall be kept **simple** without loosing expressiveness. The **Business Process Modeling Notation (BPMN)** is a standard for defining, visualizing and exchanging business procedures within (A2A) and across (B2B) enterprises and is widely used within disciplines related to BNM like **Business Process Management (BPM)**. We decided to base our **Network Integration Model (NIM)** on BPMN, since it best meets our requirements.
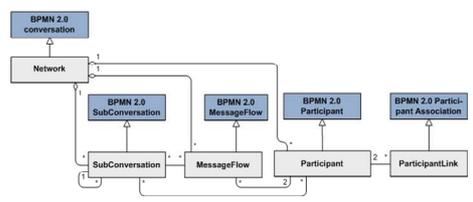
Network Integration Model (NIM)

The business network as represented with NIM is defined as subset of BPMN version 2.0 by mapping it onto the basic entities of the network. The *Network* itself is represented by a BPMN conversation diagram, as a special type of collaboration diagram, and defines a superset of the computed network and all manual extensions. The network is used as entry point for visualizing and operating on the network.

Nodes and edges are the basic entities of a network. The BPMN *Participant* represents a node denoting a real-world entity, which communicates with other participants within the network. A participant has at least the following specialization: *BusinessParticipant* (business perspective, like business network), *CommunicationParticipant* (integration perspective, technical network), and *SocialParticipant* (social perspective, social network).

Participants take part in a BPMN *Conversation* or *SubConversation*, which are the aggregation entities for inter-participant communication while *MessageFlow* represents a single message exchange. A *Conversation* can be visually expanded to *MessageFlows* in BPMN 2.0.

To relate entities from different perspectives, semantic links are intoduced. For instance, for participants, a *ParticipantLink* is derived from the BPMN *ParticipantAssociation*.


(Technical) Integration Network

The integration network represents technical artifacts, like applications, A2A and B2B integration capabilities within and across an enterprise. Therefore, the model is built on BPMN Pools, referred to as *Participants*, and BPMN *Conversations* within the *ConversationDiagram* represent the process, document and control flow between business partners, applications and systems. For instance, the NIM representation shows an outbound delivery process of an enterprise in the (technical) integration perspective, in which the central logistics department (*HQ Logistics*) interacts via application system *HQP* with the distribution centers (*DC Hamburg/ DC Berlin*) that use application system *WMP*. They both work with external transport agencies (*Carrier 1 / Carrier 2*) that communicate via interface standards *FRADOK/ IFTMIN*. At the end the finance department (*HQ Finance*) generates an invoice via application system *HQP*.
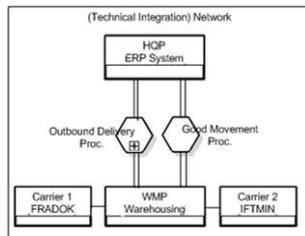
A *Conversation* can be visually expanded to *MessageFlows* in BPMN 2.0. NIM adds *MediationFlow* as a specialization and proposes a new graphical notation (not shown). This flow indicates that middleware capabilities are used while communicating the message. An alternative visualization in flow notation, shows the equivalent mediated flow in standard BPMN. For point to point connections without mediation a specialized *MessageFlow* is used, called *P2PMessageFlow*. In case of asynchronous request/ confirmation communication pattern, two *MessageFlows* are added, one for each direction, while in synchronous communication only one is used.
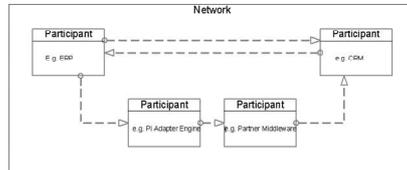

BPMN *Messages* are used to transfer data. They are mapped to synchronous service calls, e.g. in a SOA domain, an event or any kind of asynchronous messages used for A2A/ B2B processes. For that NIM leverages the BPMN 2.0 service extension point package to describe service interface (structure), operation (method) and endpoint (binding) configuration. This allows an integration of SCA artifacts into NIM. A participant can be associated to a *ServiceInterface* directly or via *ServiceOperation*, which is linked to the message and describes the action executed on the data. The *ServiceBinding* defines a configuration used for the message exchange.

Business Network

The technical entities discussed actually implement business related processing and communication, hence even if the business perspective may differ from the technical landscape, it may follow its structure. For instance, a particular business flow might consist of multiple technical flows of different types. A *BusinessParticipant* defines an organizational entity, receiving and sending messages via *BusinessFlow*, or an application artifact in an application system, e.g. *DC Hamburg* is distributing goods to *Store 1*, which is not the source or target of an outbound delivery message in a application integration process. The *OutboundDeliveryRequest* message is processed by *WMP*, which manages the stores. Stores are application artifacts, however related to the *Conversation* as *BusinessParticipant*. The *BusinessParticpant* and the *BusinessFlow* represent the business perspective of the network. *BusinessParticipants* can be semantically linked to *CommunicationParticipants* via *ParticipantLinks*.

A "Top-Level Connection" (single line, without hexagon) is an extension to BPMN to visually represent the interaction/ edges between participants and group their *Conversations*, *SubConversations* and *MessageFlows*.
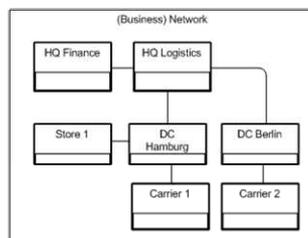
Combined Integration and Business Network

To relate different perspectives, e.g. the (technical) integration perspective with the business perspective or business perspective with a social context, a *ParticipantLink* is used which is derived from the BPMN *ParticipantAssociation*. For example, *HQ Logistics* (*BusinessParticipant*) is related to *HQP* (*CommunicationParticipant*) by a *ParticipantLink* of type "is-implemented-by". *ParticipantLinks* might not be visualized, but can be realized implicitly between network perspectives. The links are used to semantically relate participants. They can be also used as navigation links in a visual representation.

Similarly, semantic links between flows from different perspectives, called *FlowLinks*, are derived from BPMN *MessageFlowAssociation*. The semantic linking of entities across different perspectives allows business and technical persona e.g. to collaboratively work on cross-context topics coming from their perspectives.
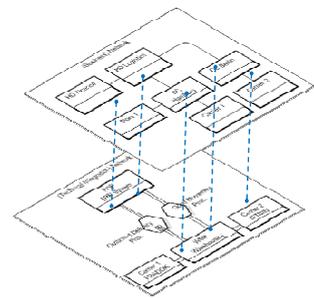
Discussion and Future Work

We presented a novel approach to define a model which uses **BPMN in a network domain**, namely the Business Network Management. Alternatives considered were notations like the Service Component Architecture (SCA), which focus on the technical communication e.g. within SOA, and business related approaches like ARIS models. However, they miss either (technical) integration or real-world business and social artifacts like contact person or business partner, thus contradicting the **"one-model"** requirement. Based on our analysis, we show how a network model can be derived from BPMN hinted on identified shortcomings. The decision for BPMN was based on the expectation to **benefit from using a widely adopted standard**, i.e. faster design of model, lower learning curve, a **standardized exchange format**, etc. BPMN with BNM extensions allows to **link between network integration and business process perspective**. Participants can be expanded to show activities and assign them to flows. This **combines the domain with BPM**, to e.g. start from the business network and drill-in to the activity level. We adopted new BPMN 2.0 concepts, e.g. **conversation diagram**, and extended them, since the technical integration perspective is not within the BPMN scope. The proposed extensions contain new model and visual elements. To **simplify the network visualization**, all flows and conversations between two participants are displayed as one line, "Top-Level Connection", and details become only available after drill-in.

Future work will be conducted for NIM especially in the areas of big networks, i.e. **hundreds or even thousands of participants**, thus structuring support such as grouping of participants, as well as the representation of business data, i.e. **bridge the gap between business and technical user**, social aspects and further network extensions.

References

Specification of Business Process Modeling Notation version 2.0 (BPMN 2.0), http://www.omg.org/spec/BPMN/2.0/PDF.

Ritter, D., Ackermann, J., Bhatt, A., Hoffmann, F. O.: Building a Business Graph System and Network Integration Model based on BPMN. In: 3rd International Workshop on BPMN, Luzern (2011).

Specification of Service Component Architecture (SCA), http://www.osoa.org/display/Main/Service+Component+Architecture+Home.

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