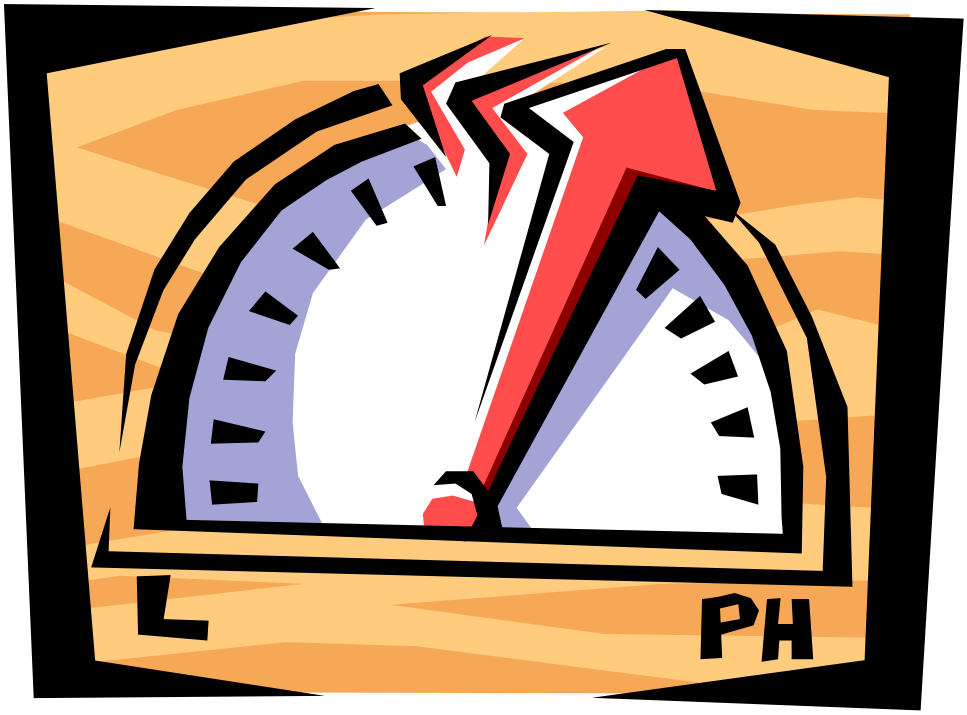

Quick Guide
Business Process Modeling Notation (BPMN)

IDM Technical Team
January 2007

The scope of this document is to provide a quick guide to the concepts and usage of the Business Process Modeling Notation (BPMN).

Document Control

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FIGURES

1 Introduction

The aim of this guide is to provide a brief introduction to the process modeling notation used in the development of the Information Delivery Manual (IDM). It is not intended that this should be a complete guide; see the reference in the footnote below for a comprehensive description. Neither is this guide intended to cover every capability of the notation; only those aspects of the notation that are commonly used in IDM development work.

2 Purpose of a Process Model

A process model describes the activities that exist within a business process. A scope statement that sets out, in broad terms, the content of the business process and the process model that exposes it.

The process model defines all of the required activities and sets them into a logical sequence. This sequence is driven by the dependency of one process on the information that is provided to it by one or more other processes. It is NOT time based and should not be confused with scheduling of tasks as may be represented in a GANTT chart or PERT diagram.

A process model can be developed to a very fine or very coarse degree of detail. The more precise the model, the more specific it becomes to a particular process as practised in one place. If it is less precise, it can be used with a high degree of generality.

Process models are used in IFC specification development projects as the means to discover and capture the information content of a business process and how that information is to be exchanged between participants in the process.

Process models can also be used for other purposes including:

- Quality Assurance
  A quality manual expresses activities to be undertaken, sequences of activities, roles and responsibilities and audit requirements. All of these can be expressed within a process model.
- Business Process Improvement
  A process model enables the capture of ‘as-is’ information about a process. This model can then be analyzed and redeveloped as a ‘to-be’ process model that describes improvements.

3 Preferred Notation

For IDM, the preferred notation for process model development is the ‘Business Process Modelling Notation’ (BPMN) developed by the Object Management Group (OMG)1.

BPMN is a recently developed notation that appears to be rapidly gaining acceptance amongst the modeling and business communities.

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[1] Business Process Modeling Notation (BPMN) Specification: Final Adopted Specification, OMG, February 2006, http://www.bpmn.org/Documents/OMG%20Final%20Adopted%20BPMN%201-0%20Spec%2006-02-01.pdf

BPMN was developed by a group of experienced process modelers within OMG to address a number of issues that were not commonly dealt with by prior notations and to merge ideas into a single, standard, accepted approach. In doing this, BPMN development considered and adapted appropriate ideas from a number of prior developments including UML Activity Diagram, UML EDOC Business Processes, IDEF, ebXML BPSS, Activity-Decision Flow (ADF) Diagram, RosettaNet, LOVeM, and Event-Process Chains (EPCs).

3.1 BPMN Goal

The primary goal of BPMN is to provide a notation that is readily understandable by all business users,

- business analysts that create the initial drafts of the processes,
- technical developers responsible for implementing the technology that will perform those processes,
- business people who will manage and monitor those processes.

Thus, BPMN creates a standardized bridge for the gap between the business process design and process implementation.

3.2 Rules of the BPMN Notation

A key element of BPMN is the visual appearance of the diagram in terms of the shapes and icons used for the graphical elements. These MUST conform to the shapes and markers as defined in the BPMN specification.

The specification may be extended by associating new markers or indicators with graphical elements e.g. to highlight a specific attribute of an activity or to create a new type of event.

Specification extensions can also include coloring an object or changing a line style of an object, providing that the change does not conflict with any BPMN defined line style.

4 Elements

Within the BPMN notation, there are four principal types of element namely actors, processes, connections and artefacts. The key concept is that of ‘process’ (since that is what the notation is concerned with); all other element types act on the process for a given purpose. Specifically:

- Actors (or actor roles) perform processes;
  this also includes sub-actors who may be identified within the process flow as e.g. departments of an organization,
- Connections connect processes;
  this describes either the logical sequence in which processes occur or message passing between processes,
- Artefacts either elaborate or annotate processes;
  elaboration being the expression of the data within or between processes and annotation simply providing further information.

This is graphically shown in fig. 1. Note that the notation also supports the idea of a process being broken down into smaller sub-processes.

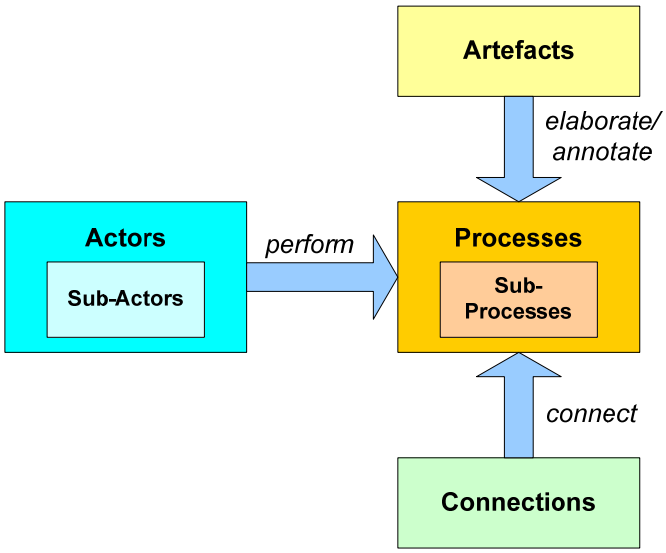


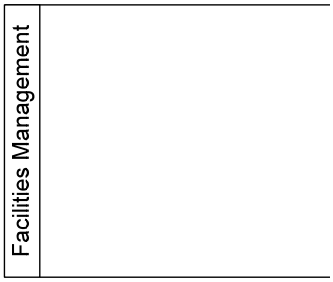
Figure 1: Main element types and relationships in BPMN

The major components of the BPMN notation are processes2 and connections. Processes are specified in a box (typically with rounded corners) whilst connections are arrows that link the processes together in sequence or show a message passing between processes.

4.3 Actors

Although the key concept is that of process, the definition of actors is considered first. This is because all processes are owned by (performed by) a particular, identifiable actor.

Actors are identified on process models by boxes in which processes are contained. These boxes are known as either ‘pools’ or ‘lanes’.



A Pool represents a Participant in a Process. It is also acts as a graphical container for a set of processes performed by the participant that can be described in sequence.

Figure 2: Pool for a 'participant'

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[2] Processes may also be known as ‘activities’

Figure 3: Lane for category of process

A Lane is a partition within a Pool that extends over its entire length. Lanes are used to organize processes. In particular, lanes can be used to categorize processes within the participant role e.g. by representing sub-actors or departments of an organization

Figure 4: Pool containing multiple lanes

4.4 Processes

Processes may be either ‘compound’ meaning that they can be broken down further into smaller sub-processes or ‘atomic’ meaning that further breakdown is not possible.

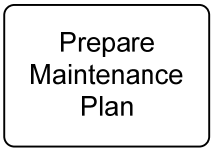


Figure 5: Task

An atomic process is termed a ‘Task’. The task is the basic unit of the BPMN notation

A compound process may be shown on a business process diagram either with its sub-processes collapsed or expanded.

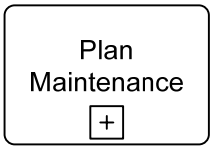


Figure 6: Collapsed sub-process

In a collapsed sub-process, the details of the sub-process are not visible in the diagram. A “plus” sign in the lower-center of the shape indicates that this is a sub-process and has a lower-level of detail.

In an expanded sub-process, the boundary of the sub-process is expanded and the details (a process) are visible within its boundary.

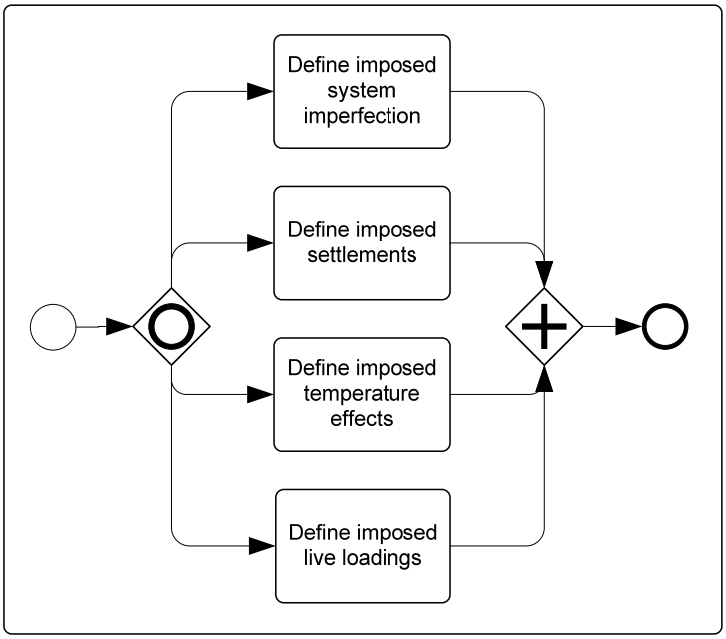


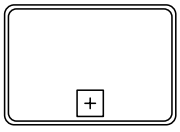
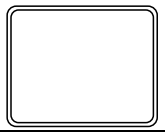
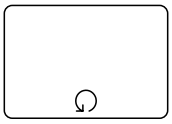
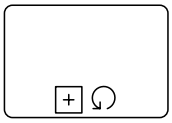
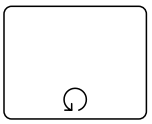
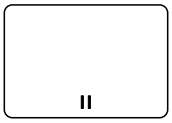
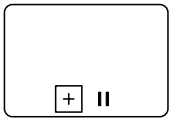
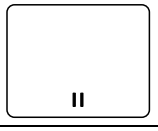
Figure 7: Expanded sub-process

Processes have an identifying name that describes what action is being undertaken. Within the IDM, by convention, the name is a phrase starting with a verb. This indicates the performance of an action.

4.4.1 Process Markers

Processes can include markers that define attributes of the process. A marker is a symbol that is placed at the bottom of the process shape. Several attributes can be applied concurrently. However, some types of attributes cannot be applied together as they effectively mean similar things e.g. the loop market inherently identifies multiple instances of a process.

Process markers can be applied to tasks, collapsed processes and expanded processes. Available markers are shown below

	Task	Collapsed Process	Expanded Process
Transaction			
Loop			
Multiple Instance			

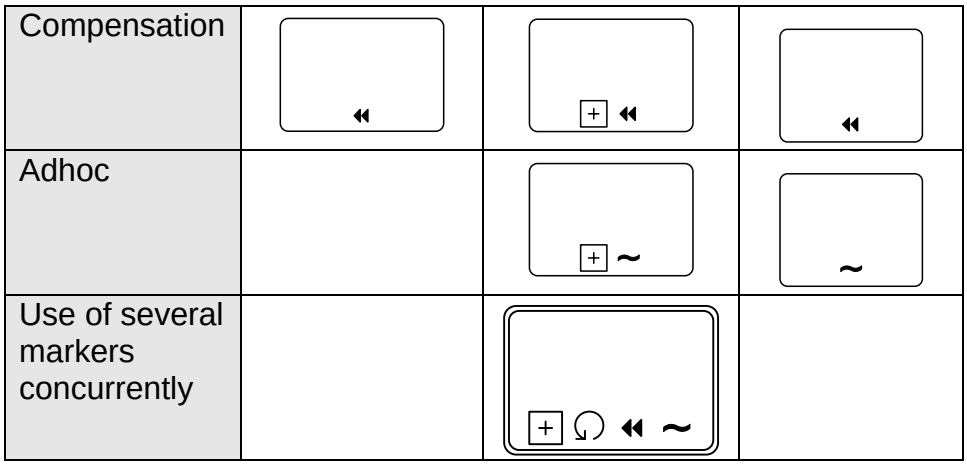


Figure 8: Different process markers

4.5 Connections

Connections are used to define the information flows that link processes. There are two main types of flow, namely sequence flow and message flow.

A Sequence Flow is used to show the order that activities will be performed in a Process.

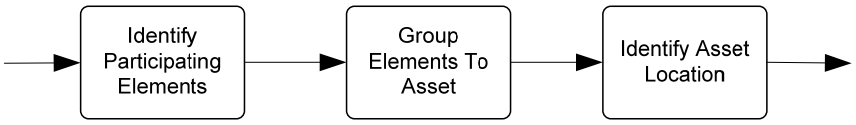


Figure 9: Sequence flow between processes

In a process model, the connection between tasks shows a logical sequence. It is not a work schedule that describes how a task is carried out in time and the start/finish relationships that can exist between tasks.

Sequence is generally defined for an actor (or actor role) and so typically, it is not expected that sequence flows will cross the boundary of a pool (although they can cross the boundaries of lanes within a pool).

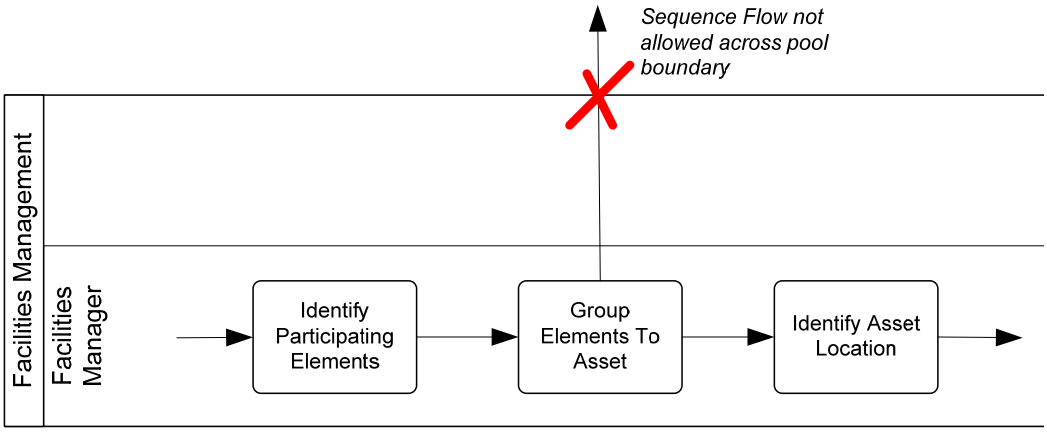


Figure 10: Sequence flow not allowed across pool boundary

A Message Flow however is generally used to pass a message, or a set of information, across a pool boundary.

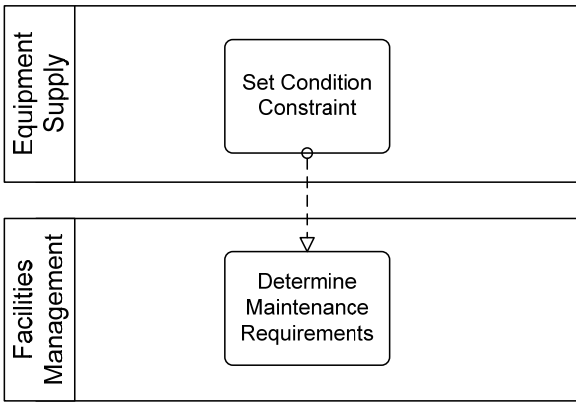


Figure 11: Message flow between processes across pool boundary

4.6 Artefacts

Artifacts are used to provide additional information about the Process. They can be used either to elaborate a process or the connection between processes by identifying the data provision (through a data object) or to annotate a process or connection with firther useful description.

Artefacts are associated with a process or connection by an association connection which is a dashed line. Associations may be directed with a direction arrow or not. In the case of IDM, the convention is that data objects represent functional parts and should therefore be directed

Data Objects are considered to be artefacts because they do not have any direct effect on the Sequence Flow or Message Flow of the Process, but they do provide information about what activities require to be performed and/or what they produce.

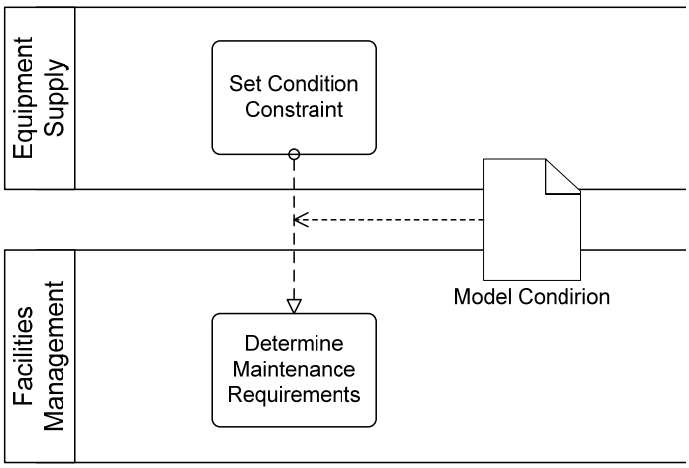


Figure 12: Data object applied to a message flow

Annotations are a mechanism for a modeler to provide additional information for the reader of a BPMN Diagram. Annotations are attached using an association connection.

Generally, this will not be directed (although it is not usually relevant whether direction is applied or not).

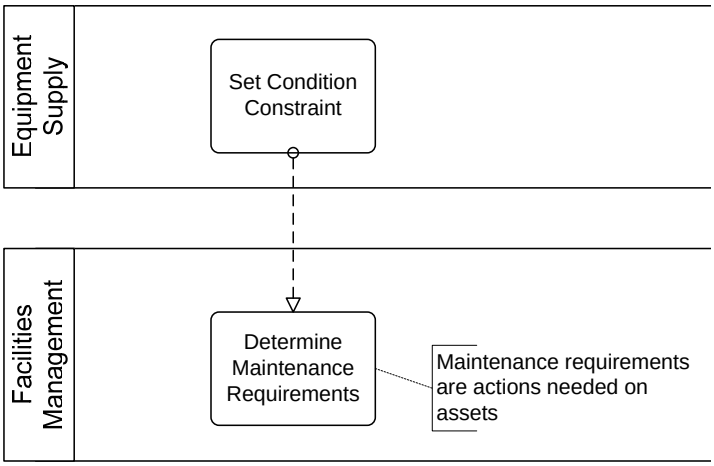


Figure 13: Annotating a process

4.7 Events

An event is something that "happens" during the course of a business process. These events affect the flow of the process and usually have a cause (trigger) or an impact (result). Events are circles with open centers to allow internal markers to differentiate different triggers or results.

There are three types of Events, based on when they affect the flow: Start, Intermediate, and End.

Figure 14: Start event

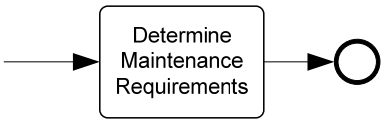


Figure 15: End event

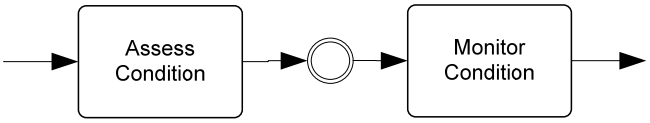


Figure 16: Intermediate event

4.7.1 Event Triggers

Events can include triggers that define the cause for the event. There are multiple ways that these events can be triggered. End Events may define a “Result” that is a consequence of a Sequence Flow ending.

	Start	Intermediate	End	
Message				Identifies that an event may start from or result in a message
Timer				Identifies an event that is time based e.g. something that is required to happen on a monthly basis.
Rule				Identifies something happening as a result of a rule being triggered e.g. the condition of an element is considered to be beyond an acceptable state which requires that maintenance work should be carried out.
Link				Used to link a sequence flow (allowing a sequence flow to be broken and made invisible).
Multiple				Identifies that an event may be caused by or result in multiple triggers.
Error				Event is an error that has occurred.
Compensation				
Cancel				Event identifies that the process is cancelled.
Terminate				Event identifies that the process is terminated.

Figure 17: Different event triggers

4.8 Gateways

A Gateway is used to control the divergence and convergence of Sequence Flow. Thus, it will determine branching, forking, merging, and joining of paths. Divergence and convergence occur as a result of behavior control; essentially the result of taking a decision. Thus, a gateway can be seen as equivalent to a decision in conventional flowcharting and is similarly described as a diamond shape.

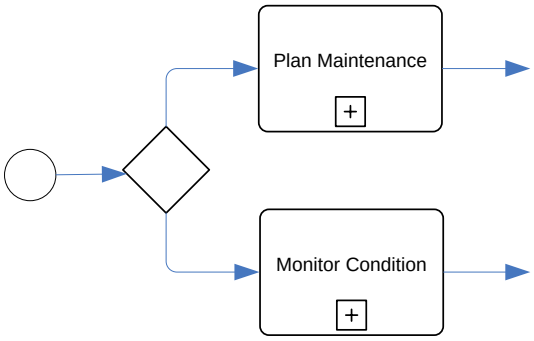


Figure 18: Diverging gateway

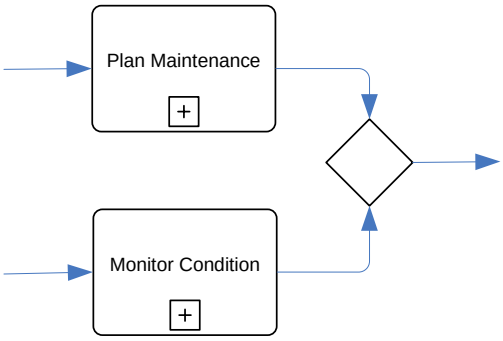
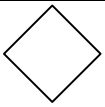


Figure 19: Converging gateway

4.8.1 Gateway Markers

Gateways can include markers that further elaborate the type of behavior control. A marker is a symbol that is placed inside the diamond gateway shape.

	Exclusive (XOR) data based decision and merging. This icon can be shown with or without an included “X” marker (shown here without). An Exclusive Gateway (XOR) restricts the flow such that only one of a set of alternatives may be chosen. This Decision represents a branching point where alternatives are based on conditional expressions contained within the outgoing Sequence Flow (e.g. if X > Y). Only one of the alternatives will be chosen.
	Exclusive (XOR) event based decision and merging. An Exclusive Gateway (XOR) restricts the flow such that only one of a set of alternatives may be chosen An event based decision is taken as the result of the occurrence (or non-occurrence) of a particular event. This Decision represents a branching point where alternatives are based on an event that occurs at that point in the Process. The specific event, usually the receipt of a Message, determines which of the paths will be taken. Other types of Events can be used, such as Timer. Only one of the alternatives will be chosen.

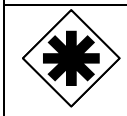
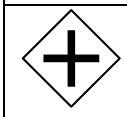
	Inclusive (OR) decision and merging. This decision represents a branching point where alternatives are based on conditional expressions contained within the outgoing sequence flow. In some sense it is a grouping of related independent Yes/No Decisions. Since each path is independent, all combinations of the paths may be taken, from zero to all. However, it should be designed so that at least one path is taken.
	Complex decision making and merging. A decision may be based on the occurrence of complex conditions and situations. For instance, it may require a subset of 3 of a total of 5 data items to have achieved a particular value or 4 out of a possible set of 6 events to have occurred.
	Parallel (AND) decision and merging. A decision is that all paths are possible or that all paths merge to give the result.

Figure 20: Different gateway markers