PROJECT MANAGEMENT IN OPENBIM

KLO 1 | The basic of procesess within the framework of buildingSMART standards

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BILT ACADEMY SUMMIT 2019 | **MOTHERWELL** | 8 OCT 2019

The mentor

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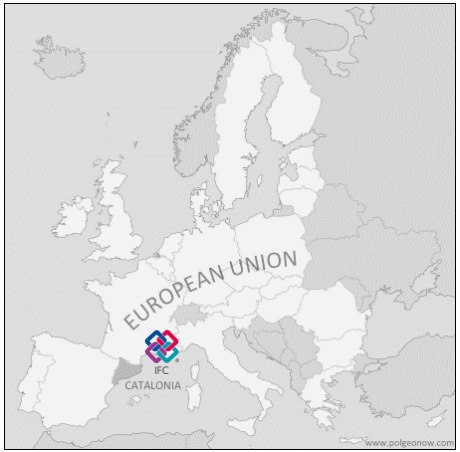

openBIM Consultancy
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Master's in BIM Management
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Vice-President Design Area

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BIM user group of Catalonia
Board member

BIMcat

Building The Future Comission
CoAC representative

ITeC

Key learning objectives #01

• Learn which are the main buildingSMART standards, especially about Data and Processes.

• Learn the basics of Process Mapping, exchange requirements and BPMN as the standard to represent which is defined in an IDM.

• Understand the basics of IDM (Information Delivery Manual), as the international standard for defining the information that should be exchanged between project participants in the AEC project lifecycle.

openBIM and buildingSMART standards introduction

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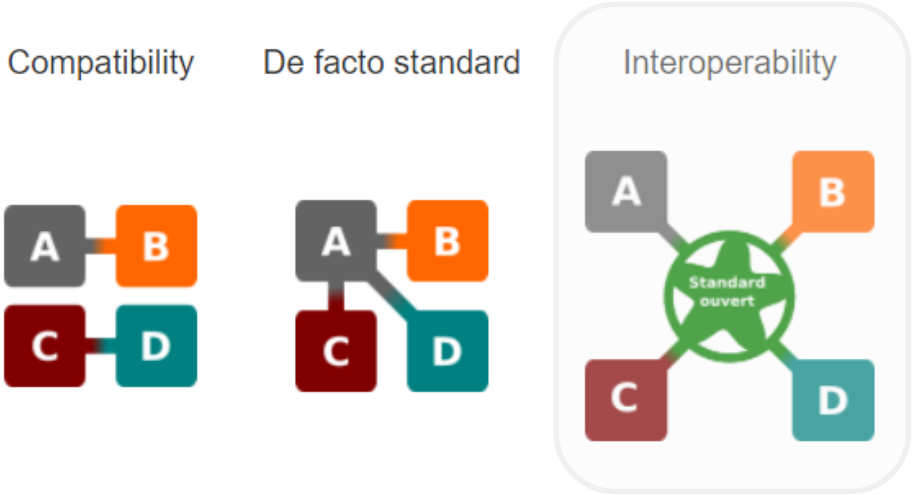
Degree of operability

*"**Interoperability** is a characteristic of a product or system, whose interfaces are completely understood, to work with other products or systems, present or future, in either implementation or access, without any restrictions."* (Source: Definition: Interoperability. http://interoperability-definition.info/en/)



appropriate communication behaviour that allows reaching a successful technology implementation

Interoperability

"The freedom to work with the best in any discipline and using the tools with which we feel more comfortable and productive" *(Areo, 2016)*

What is openBIM

openBIM is a universal approach to the collaborative design, realization, and operation of buildings based on **open** standards and workflows. (non-proprietary)

It is an initiative of several leading software vendors using the open buildingSMART Data Model.

buildingSMART, since 1995

What is buildingSmart

- An international, neutral and non-profit organisation that supports openBIM.
- Organized as regional alliances, so-called chapters, for countries or groups of countries.
  - Each chapter is an independent and is established to reflect local conditions.
  - There are chapters in Europe, North America, Australia, Asia and the Middle-East.

buildingSMART International home of openBIM

- Develop and maintain international standards for openBIM.

buildingSMART International home of openBIM

buildingSMART International

VALUES	GOALS	CORE STANDARDS FOCUS
Open	Create open BIM standards	Data
Neutral	Host open BIM forum	Processes
Not-for-profit	Certify software and people	Data dictionaries
International	Become a trusted resource	BIM standards
	Promote active use	

buildingSMART **CHAPTERS**

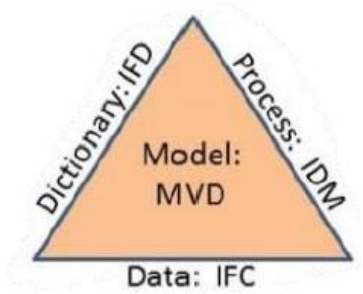
AUSTRALASIA	GERMANY	SINGAPORE
BENELUX	HONG KONG	SPAIN
CANADA	ITALY	SWEDEN
CHINA	JAPAN	SWITZERLAND
DENMARK	KOREA	UK & IRELAND
FINLAND	MALAYSIA	USA
FRANCE	NORWAY	

buildingSMART **PARTNERS**

ISO, CEN, OGC

openBIM Standards

- Consensus industry standards
- Project-based requirements
- Open and Continuous update



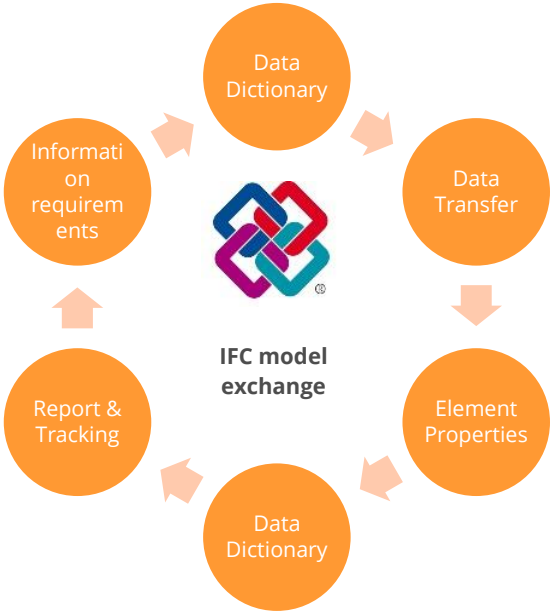
What it does	Name	Standard
Describes standardized processes	**IDM** Information Delivery Manual	ISO 29481-1 ISO 19481-2
Transports Information / Data maintaining ownership	**IFC** Industry Foundation Class	ISO 16739
Reporting and tracking	**BCF** BIM Collaboration format	BuildingSMART BCF
Mapping of terms	**IFD** International Framework for Dictionaries	ISO 12006-3 buildingSMART Data Dictionary (**bSDD**)
Translates processes into technical requirements. IFC view filter	**MVD** Model View Definition	BuildingSMART MVD

openBIM workflows

The information exchange is based on the open exchange standard called **IFC (Industry Foundation Classes)**.

IFC is a restricted copy of the original native digital prototype, not intended to be edited, based on an open data Schema.

Any **change need** towards the original model has to be **requested to the author**. Then, the model author makes the requested change in the native model and creates the model as a new IFC



BuildingSMART openBIM Standards communication cycle. Source: Baldwin, M. (2019). The Bim-Manager a practical guide for BIM project management. Berlin: Beuth Verlag GmbH.

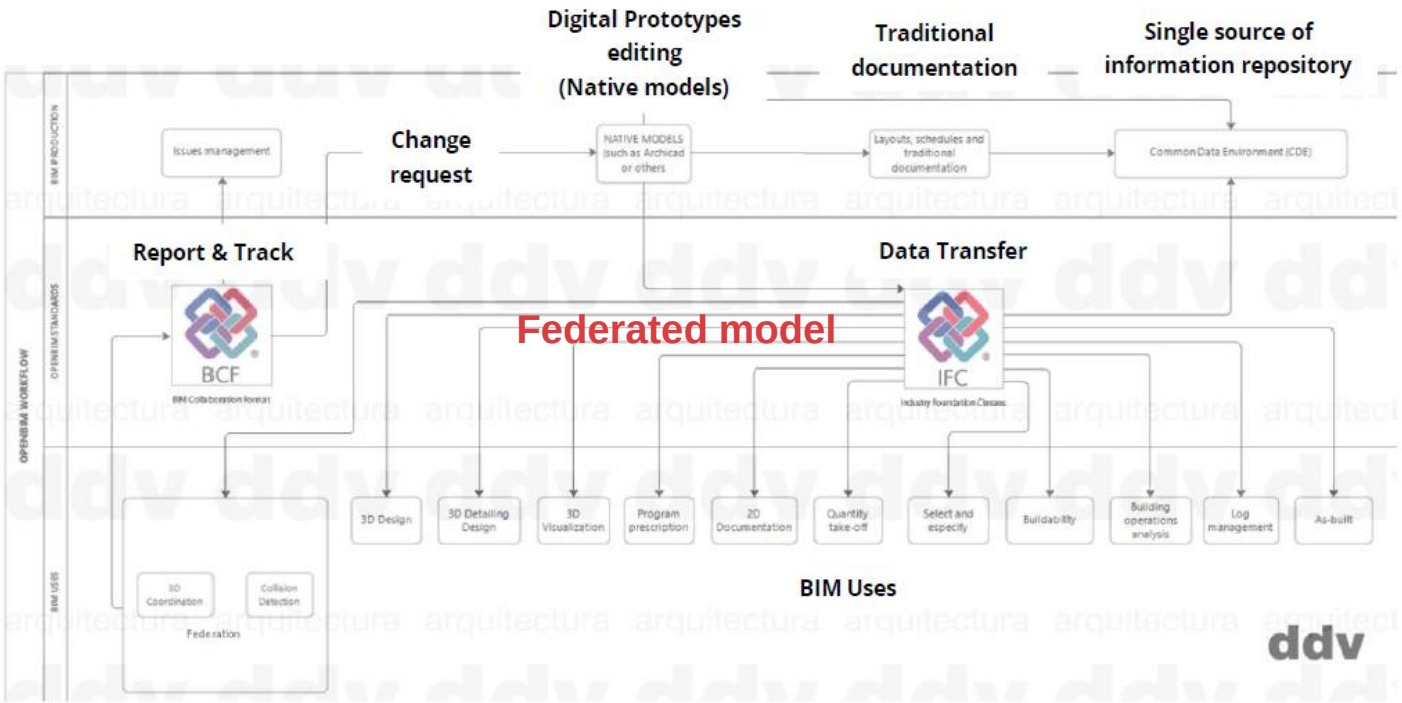
For what

BIM USES

openBIM STANDARDS

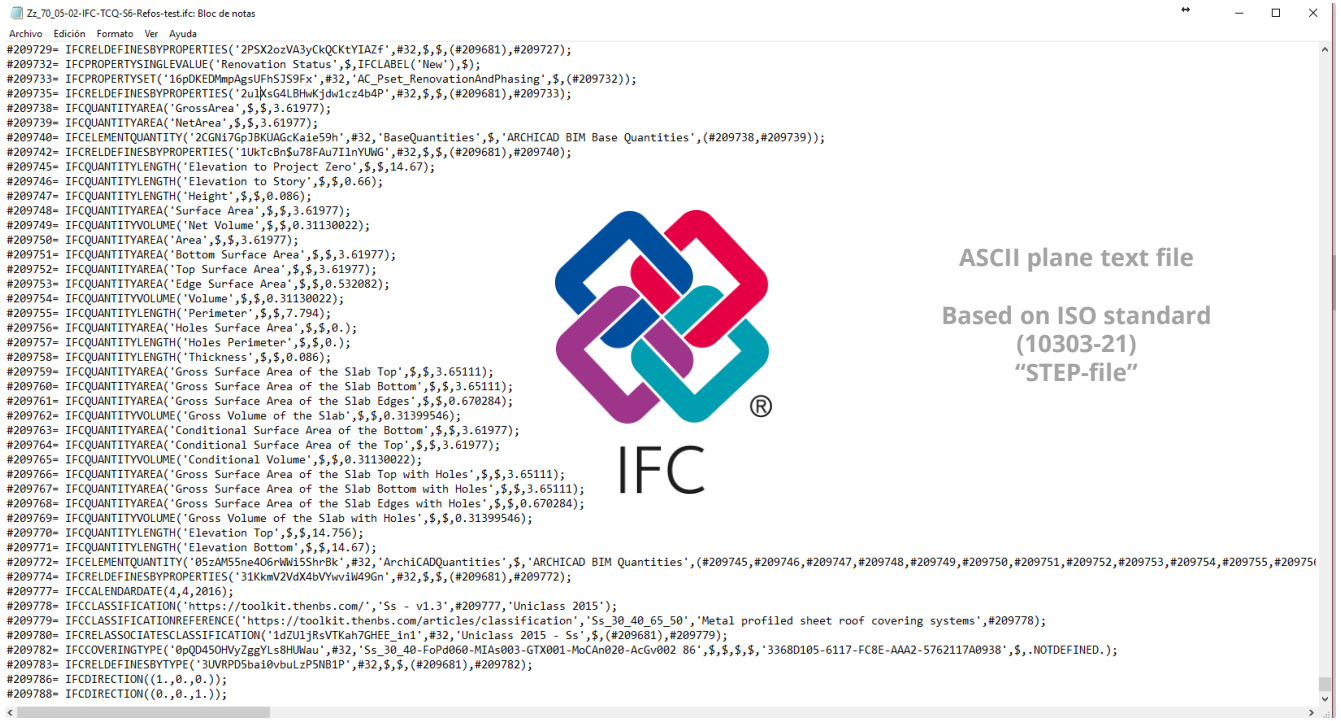
BIM PRODUCTION

openBIM workflows



OpenBIM workflow. Source: DDV openBIM Solutions.

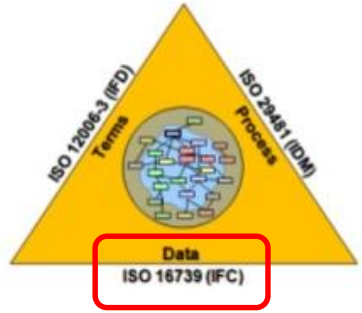
IFC, as data file

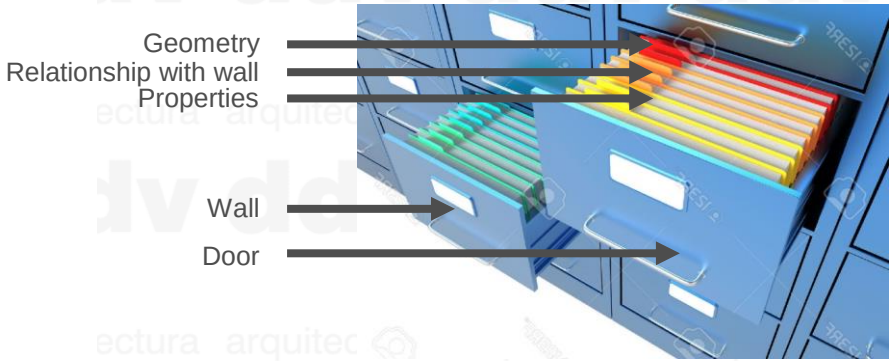


IFC, definition

IFC

- Store that information that can be reused
- It includes information about the design, processes, resources, agents.
- Well defined and documented data schema
- Provide the rules to determine which information will be exchanged



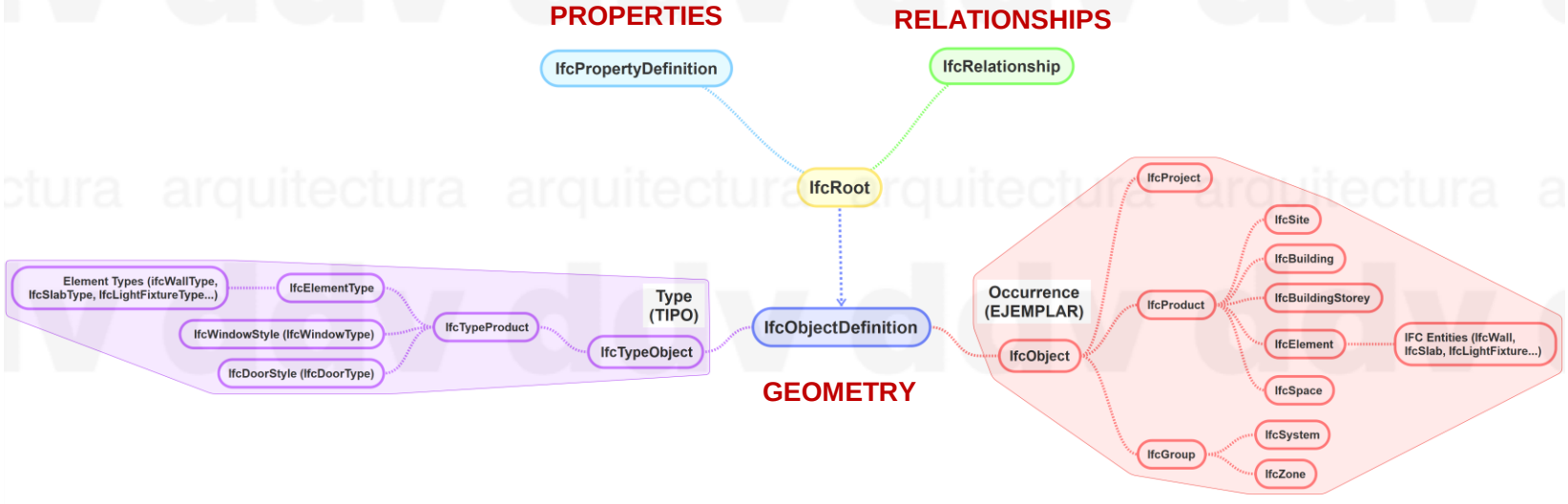


Concept source: AEC3

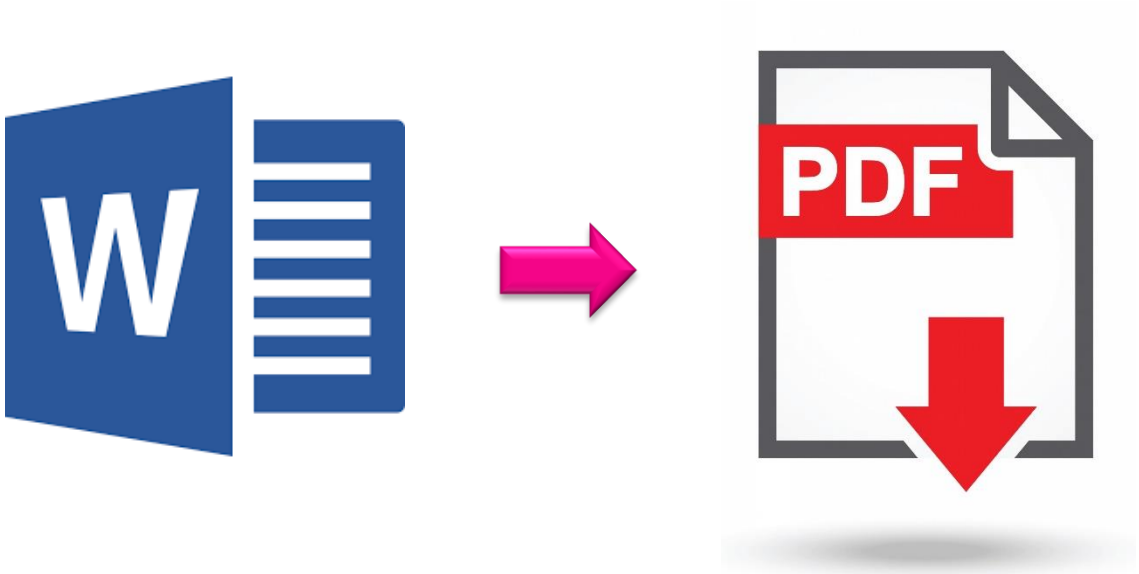
Key values

- open
- neutral
- comprehensive
- customizable
- extensible

IFC entities (classes)



Key points



ISO 32000-1:2008

Key points

IFC key points

Native BIM

*.pla, *.pln, *.rvt, *.nws

Key points

openBIM

DATA Exchange using

pen standards

***.ifc, *.bcfzip**

Key points

Open BIM vs closed BIM

Native + Open Standard = **openBIM**

Native only = closed BIM

Key points

MVD, Model View Definition

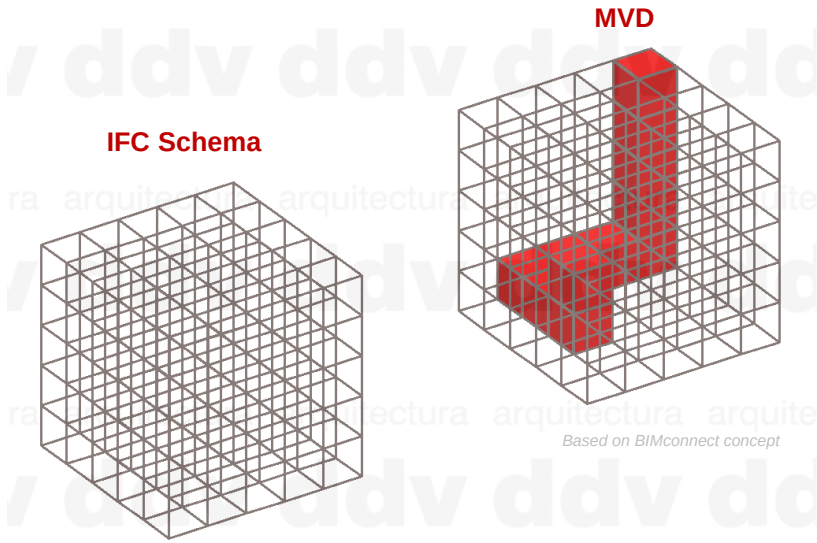
There is **no “all-in-one”** IFC

A complet IFC is a Schema definitions repository for all disciplines and whol life-cycle.

A **Model View Definition (MVD)** defines a subset of the IFC schema that is needed to satisfy one or many Exchange Requirements of the AEC industry

Any IFC production means

1…n Model View Definitions (MVD).



MVD, current development

IFC2x3 **Coordination View 2.0 (CV 2.0)**
Add-on's
Quantity Take-off add-on view
Space boundary add-on view
2D Annotation add-on view

IFC2x3 **Coordination View**
IFC2x3 **Structural Analysis View**
IFC2x3 **Basic FM HandOver view**

IFC4 **Reference View (RV)**
IFC4 **Design Transfer View (DTV)**

BCF, BIM Collaboration Format

OPEN STANDARD TO COMMUNICATE

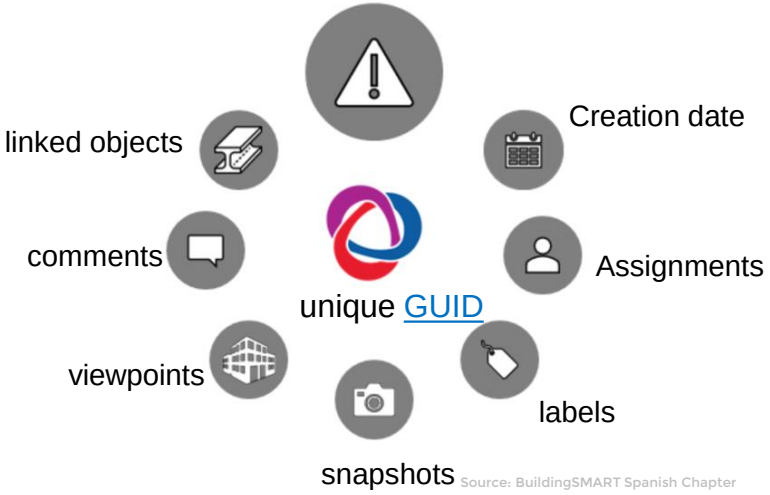
ZIP Container
XML (Extensible Markup Language)

ISSUE TRACKING

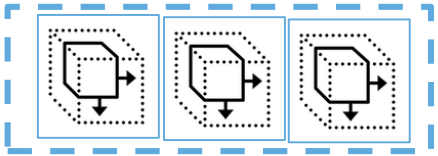
for openBIM workflows

- IDENTIFIED
- ISSUED
- SOLVED

without containing
any model element
geometry itself.

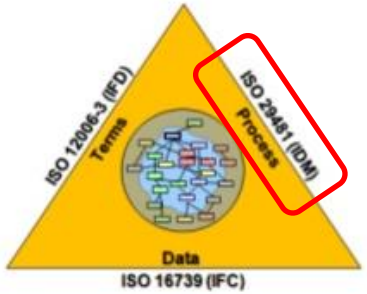


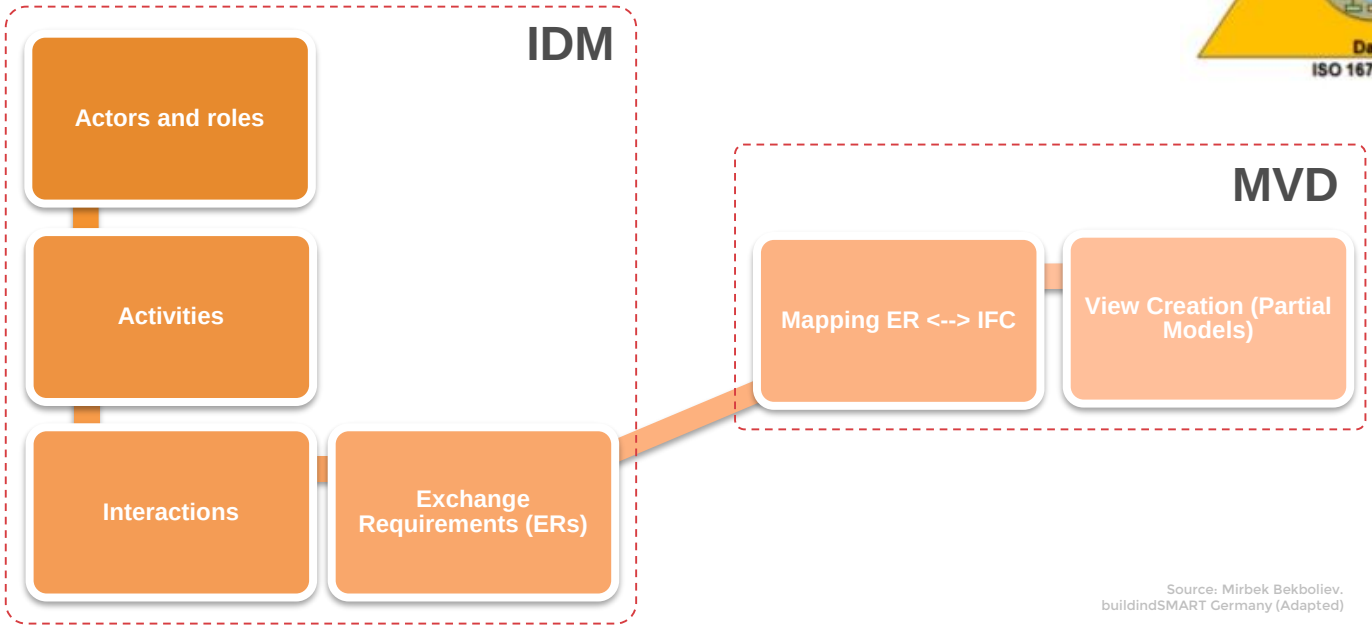
BCF
BIM Collaboration Format



IDM, Information Delivery Manual

MODELING OF BIM-RELATED PROCESSES





Source: Mirbek Bekboliev.
buildindSMART Germany (Adapted)

IFD, International Framework Dictionary

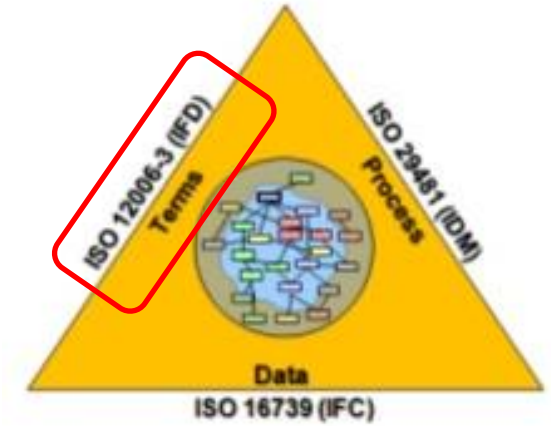
buildingSMART Data Dictionary

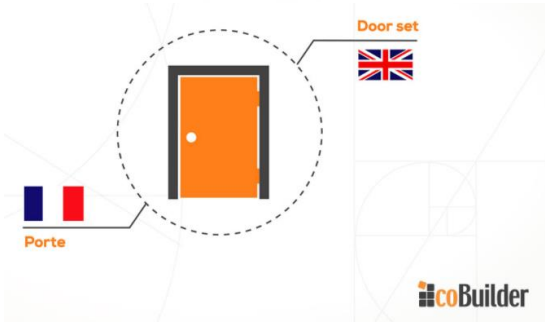
bSDD , ISO 12006-3:2007

Mechanism that allows the creation of ontologies and multi-language dictionaries

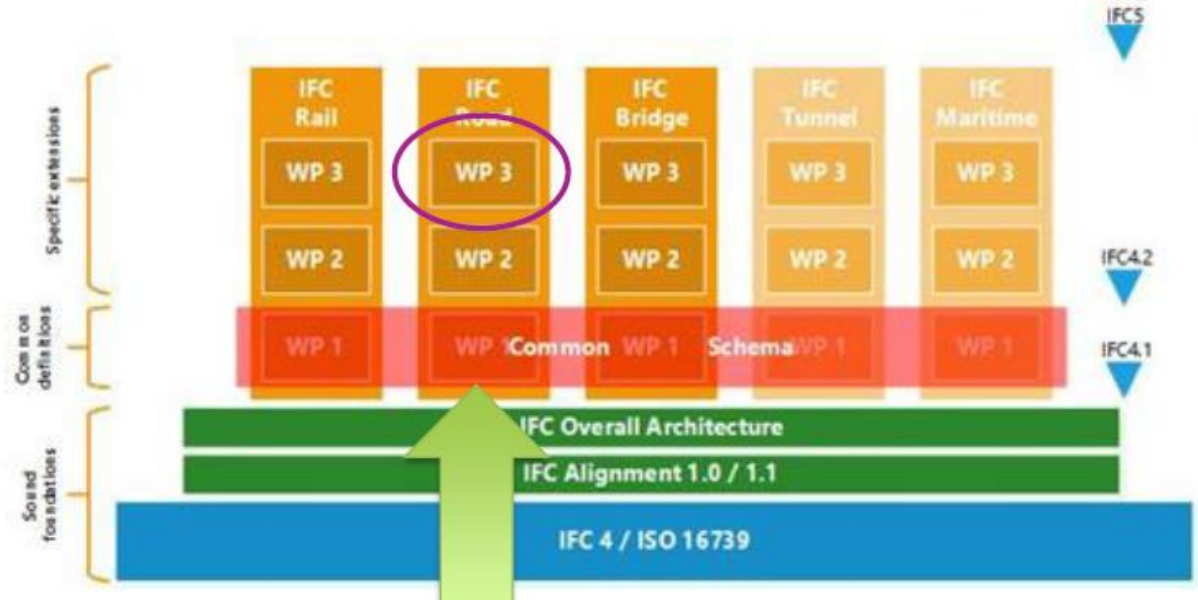
A reference library where "everything" appears.

It works like a semantic map that connects similar terms based on their meaning in the constructive context.





openBIM for Infrastructure



The bSi InfraRoom is running these projects in parallel and is planning to finish 2020

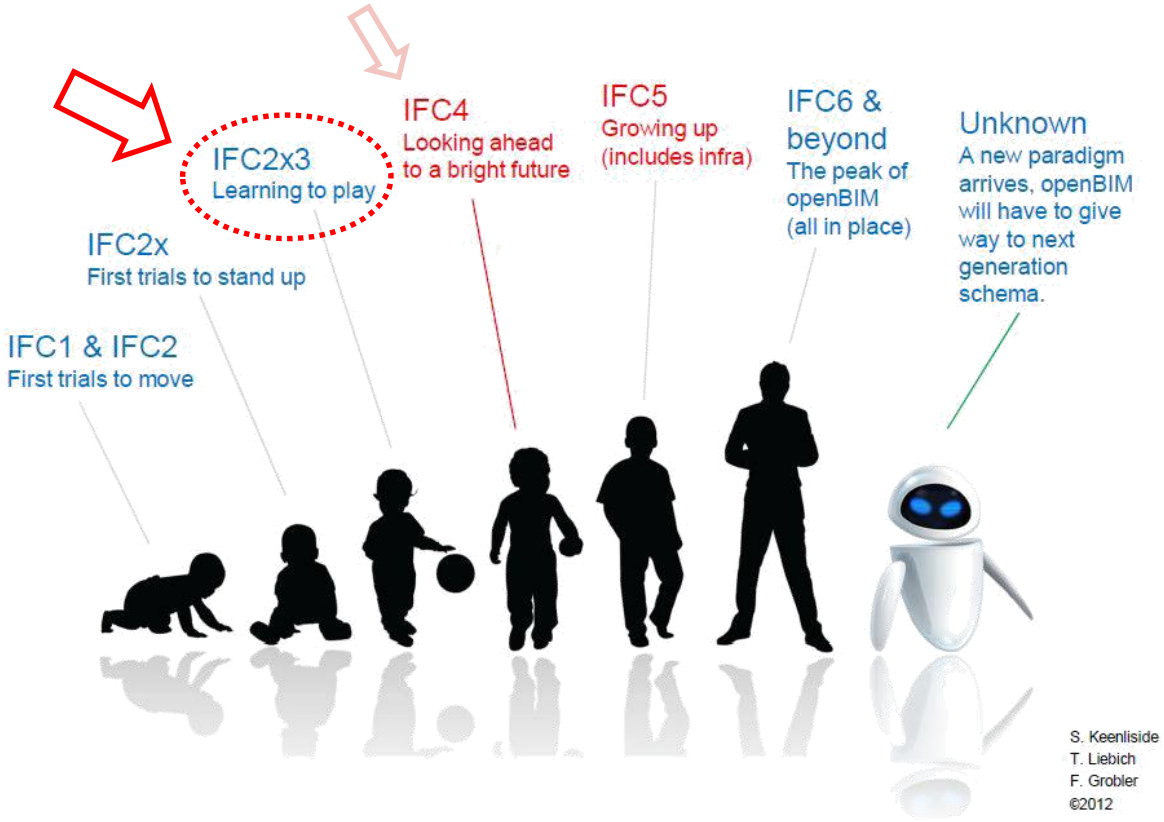
Future of openBIM

2019!

First

IFC4 Reference View 1.2 Export Certification (Architectural Reference Exchange)

Vectorworks
Archicad
...
?



Once openBIM basics are done...

Let’s dive into

project management

Process mapping basics

Process definitions

- It is a sequence of steps arranged with some type of logic aimed at achieving specific results, graphically represented by a process map
- A set of activities that are mutually related or interact, which transform the input elements into outputs

Process types

•Primary processes deliver customer value and is usually cross-functional.
Example: Order-to-Delivery.

PRIMARY

•Support processes sustain primary or management processes and is usually departmental.
Examples: Hiring, Purchase, and IT processes.

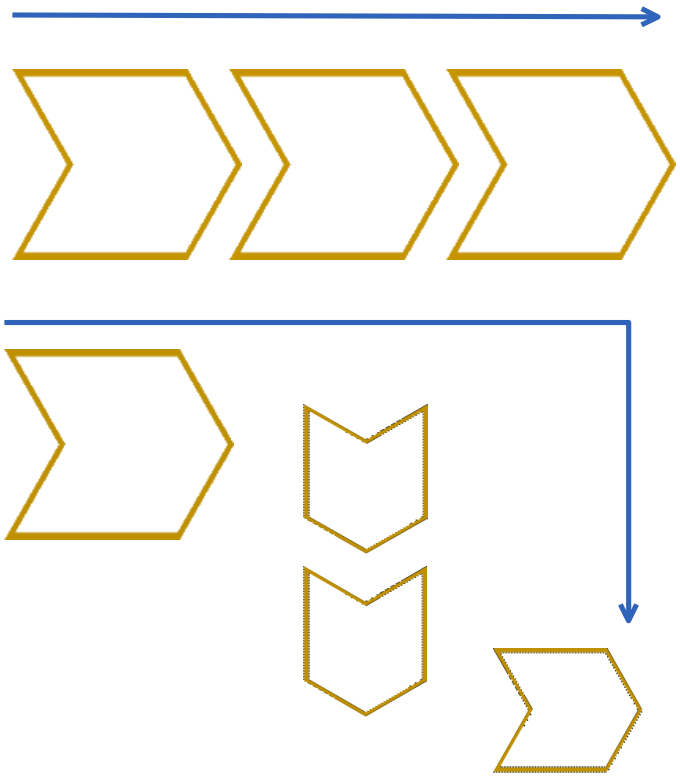
SUPPORT

•Management processes design, implement, monitor and control the other processes.
Examples: process improvement request

MANAGEMENT

Procedures

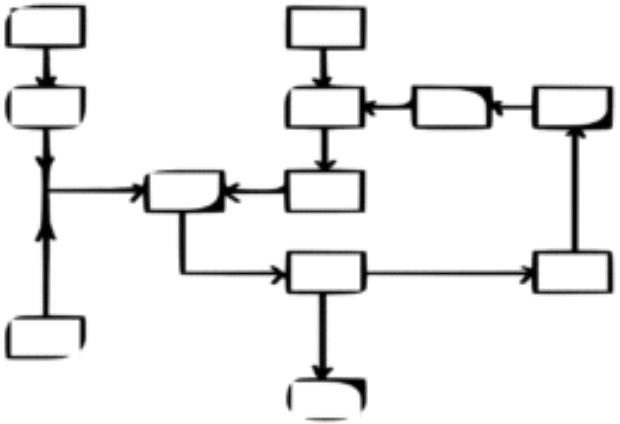
• It is the specific way of carrying out a process or a part of it.



Process map

It is the graphic representation of the processes that make up the management system.

FLOWCHART

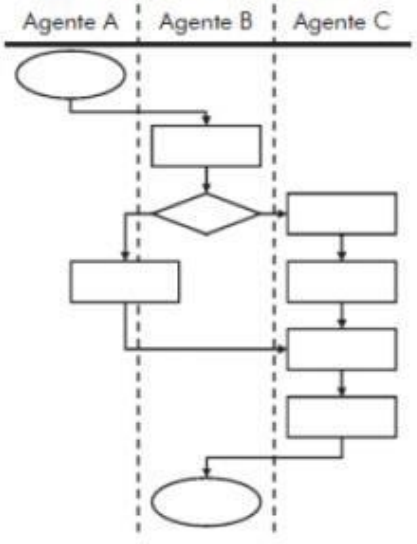


PROCESS MAP <-> FLOWCHART

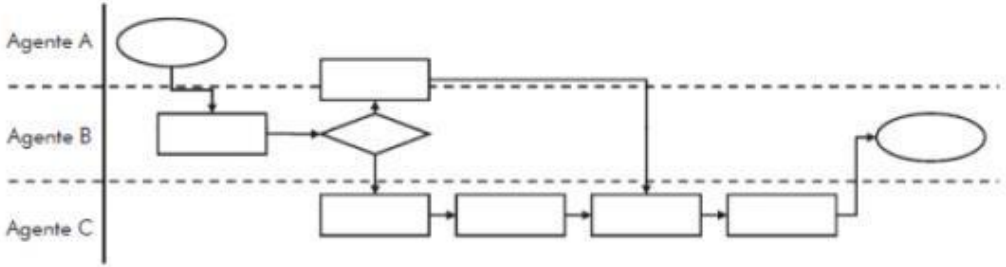
The only difference between these words is that the process mapping refers to the actual process of creating a diagram, while the diagram in itself is called flowchart

Representation forms

VERTICAL MATRIX



HORIZONTAL MATRIX

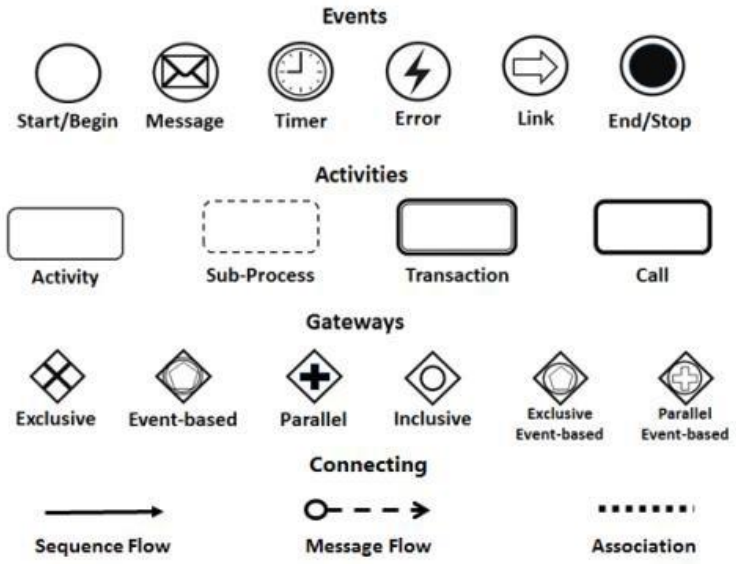


Process map creation steps

1. List the activities that make up the process
2. Describe the activities evenly, including decision points and activities resulting therefrom.
3. Identify the agents and people in charge who execute each activity.
4. Draw the sequence of activities.
5. Add inputs and outputs.
6. Identify resources and exchange information.
7. Final process review

BPMN standard

Business Process Model and Notation (BPMN, is a standardized graphic notation that allows process modeling, in a workflow format or flowchart



Based on XML

The main problem with flowcharts was that the modeling process could have different interpretations depending on who produced it.

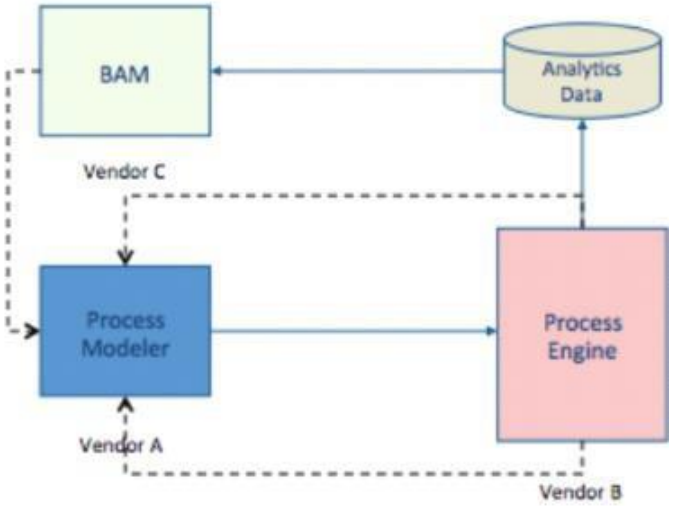
BPMN introduces a **semantic layer** in XML (Extensible Markup Language) that transforms the visual part of the diagram into something much more functional, adding XML definitions in each one of the objects, ensuring that each of the visual processes and the respective objects can only have a **single meaning**.

```
<xsd:schema …>

        …

    <xsd:element name="task" type="tTask"/>
    <xsd:complexType name="tTask">
        <xsd:complexContent>
            <xsd:extension base="tActivity"/>
        </xsd:complexContent>
    </xsd:complexType>

        …

</xsd:schema>
```

Common syntax

It enables the task of interpreting process captures:

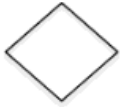
- Relevant information
- Agents involved
- Responsibilities
- Tasks and deliverables
- Manual vs. Automated



Elements

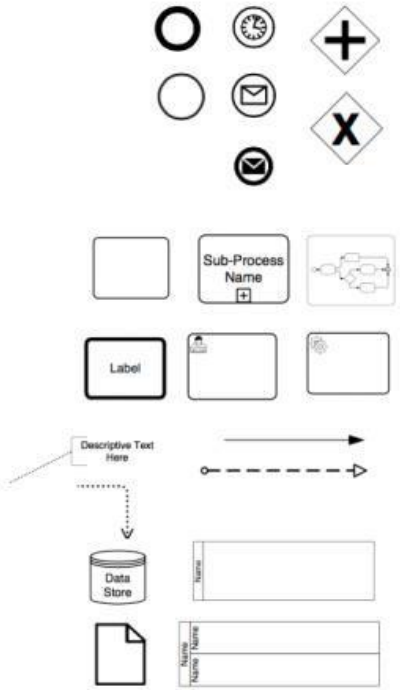
Event 

Activity 

Gateway 

Connection 

Element subclasses



Events

Start

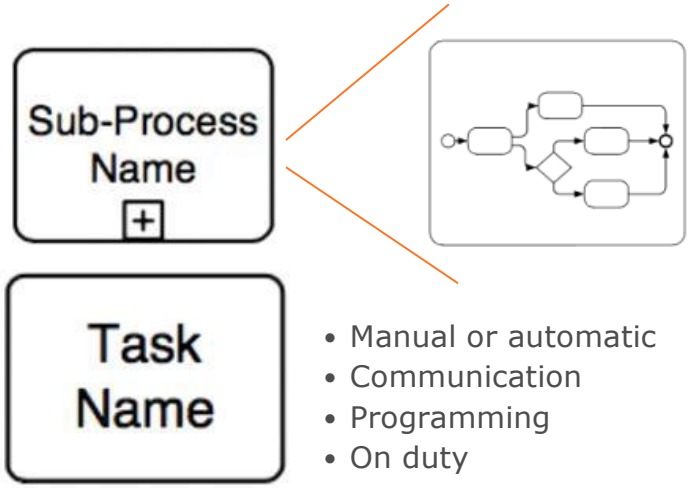
Intermediate

Process end

Activities

Subprocess, to hide or show other level of process detail.
It incorporates its own start and end events.

Task, it represents a single work unit that is not or that it can not be divided into a greater level of detail without diagraming the steps of a procedure

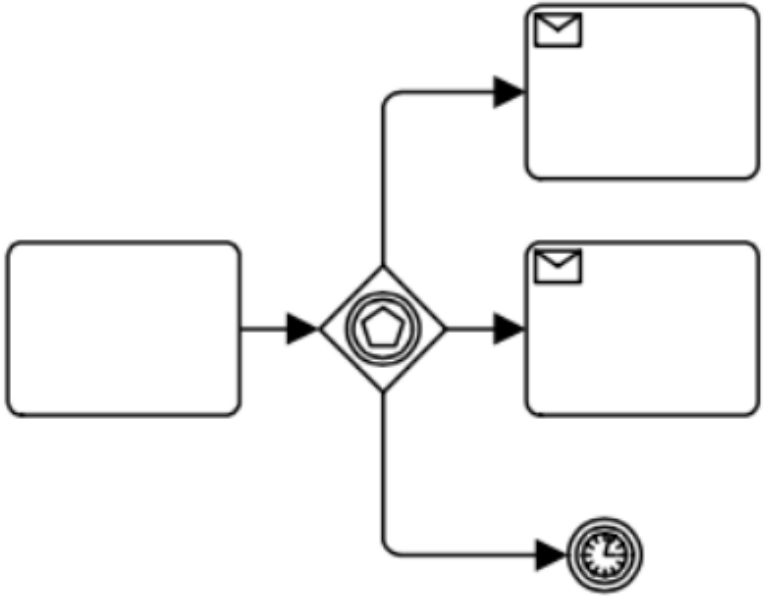


- Manual or automatic
- Communication
- Programming
- On duty

Gateways

Flow controls

Rhomboid figure that determines if branching or combining the process paths according to the express conditions

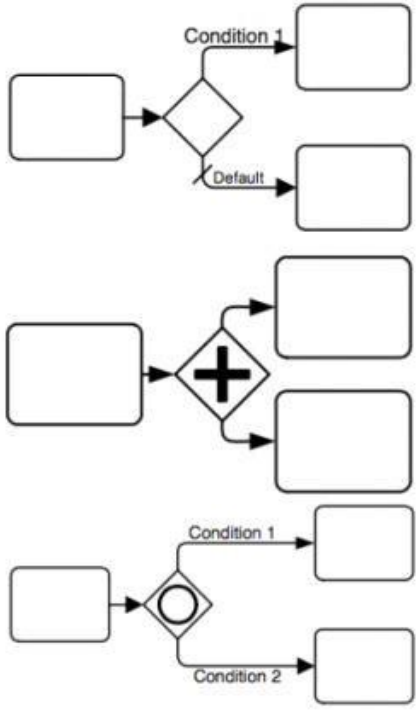


Gateway types

Exclusive - they divide the flow in different ways, where the process can continue only by one of them, depending on the established conditions.

Parallel - create or join two or more parallel paths. It does not contain any condition, it only waits for all the flows that connect to it to be completed before activating the outgoing flow. It is located at the entrance and exit of the roads to unify.

Inclusive - decision point where more than one result is possible. If a single condition is evaluated as true, the process follows the path that determines the condition. If two conditions are true, the process takes both paths.

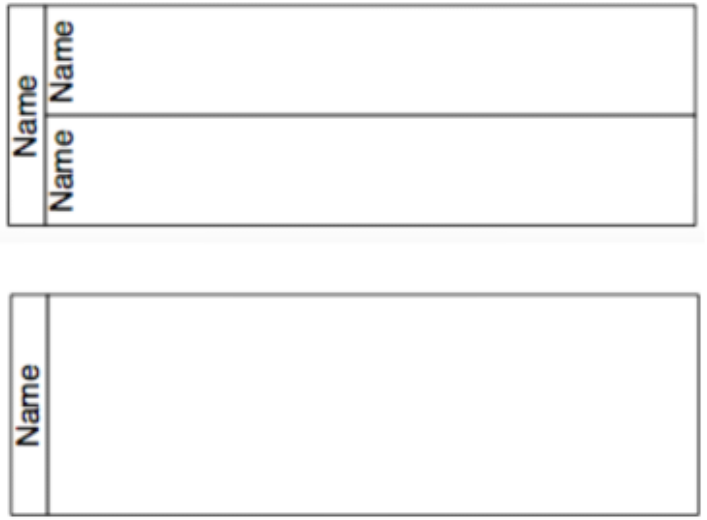


Pools and lanes

Pool represents the main participants of a process

- One pool per role

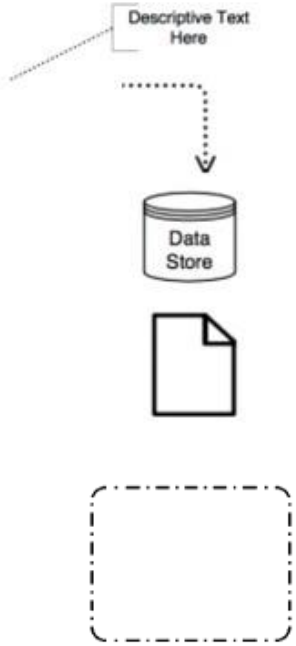
Lane is used to organize and categorize activities within the pool depending on the function or role.



Artifacts

Graphical additional information

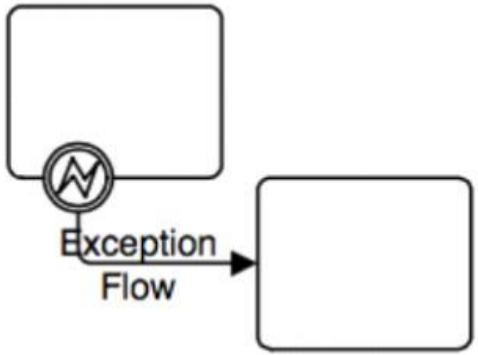
- **Annotations**: additional information
- **Data objects**: information about the inputs and outputs of information that the process requires. It does not affect the operation of the flow.
- **Groups**: visual grouping of sets of activities. It does not affect the operation of the flow..



Exception flow

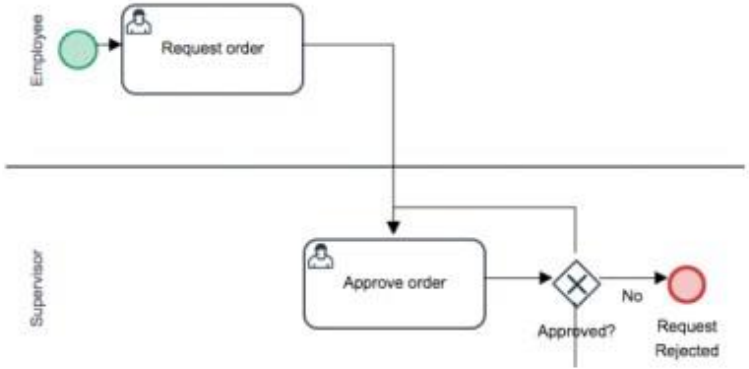
It is used as a response to non-planned issues in the process due to subprocess errors, unexpected notices, etc.

The exception flow then launches a new route of alternative or subprocess process.



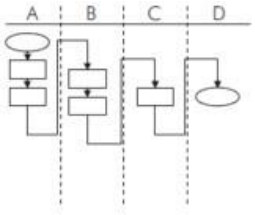
Basic rules

1. Be rigorous in reflecting the process as logically as possible, completing it with labels, sub-processes, intermittent events and behaviors.
2. Explicitly show how exceptions are handled.
3. Introduce a structure as hierarchical as possible, with processes and subprocesses from top to bottom and left to right.
4. Tag tasks
5. Represent actions with the use of verbal forms
6. Add context messages that are interspersed in the streams

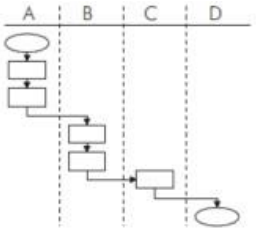


Modeling suggestions

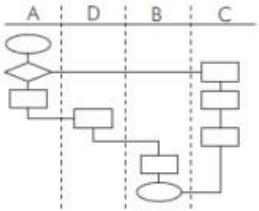
WORSE



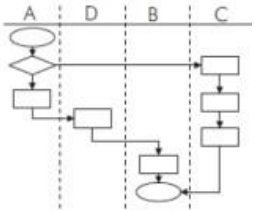
BETTER



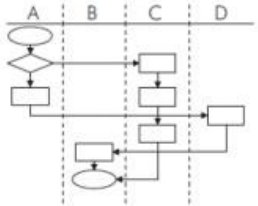
WORSE



BETTER



WORSE



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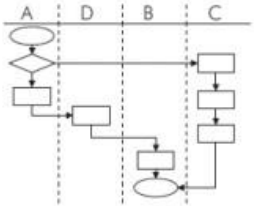


Information Delivery Manual (IDM) basics

BILT ACADEMY SUMMIT 2019

MOTHERWELL

8 OCT 2019

Use Cases

WHO provides

Which **INFORMATION**

At what **TIME**

In which **FORMAT**

In which **LEVEL OF DETAIL**

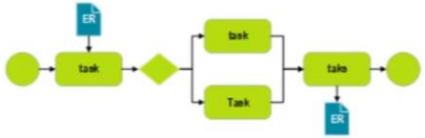
A Use Case …

- defines a **common** understanding
- enables **integrated** processes
- provides basics for the **BEP**
- **classifies** information (e.g. **IFC**)
- **provides** inputs for future **MVD's**
- is the basis for new SW applications

Use cases form the digital foundation for the construction and real estate industry

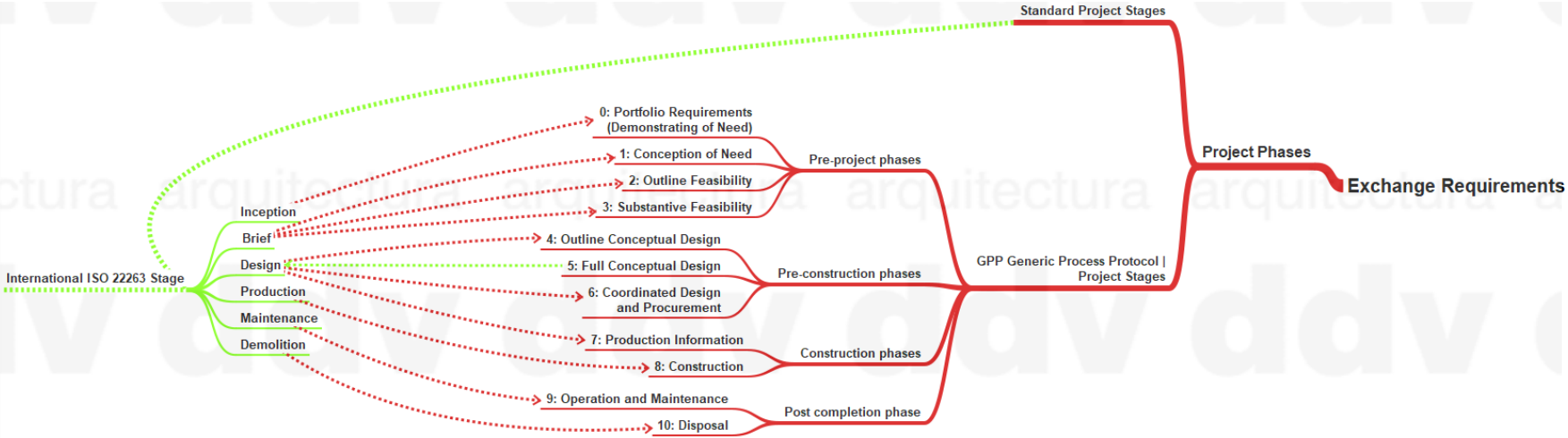
Source: Thomas Glättli, buildingSMART Switzerland/ Bauen digital Schweiz: Use Case Management

Use Case Management

scope	process map	exchange requirements
Scope and content of use case • Benefits • Objectives • Basics • Distinction 	• Achievement per project phase • Process map (BPMN) 	• Structure • Exchange requirement • discipline • Project stage • LOI/LOD • Classification (IFC, …) 

Source: Thomas Glättli, buildingSMART Switzerland/ Bauen digital Schweiz: Use Case Management

Exchange requirements and Project Phases



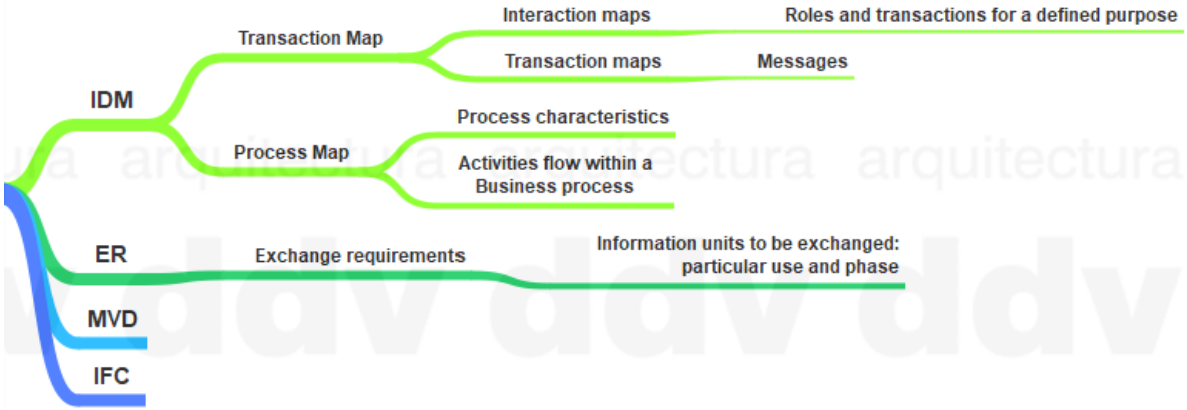
USE CASES and IDM

(EN ISO 29481-1&2)

1. Use Cases define the User Requirements

2. IDM defines Exchange Requirements).

3. The project specific Use Cases are recorded in EIR and BEP documents.

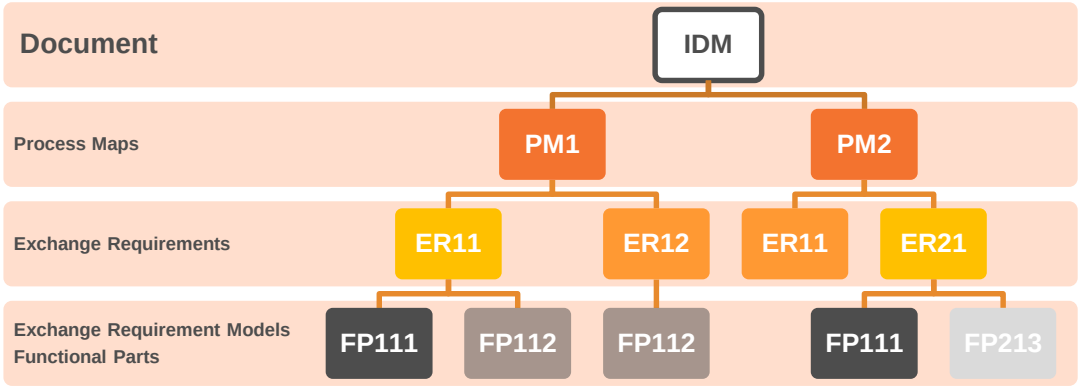


IDM artefacts

Process Map (PM): to define the industry process to be supported, including set of activities, roles and the required data inputs and outputs.

Exchange Requirements (ERs): to specify the information to be exchanged among the contractors. As a PM identifies several Ers, alignment between PMs and Ers is established using process numbers.

Exchange Requirement Models (ERM) → Functional Parts (FPs): to allow mapping IDMs to concepts in Model View Definitions (MVD, ISO 29481-3)



Components of an IDM.

Based on Ana Roxin and Udo Kannengiesser

"A functional part describes the information in terms of the required capabilities of IFC. For IDM as presently established, the functional parts are based on versions of the IFC model". buildingSMART International.

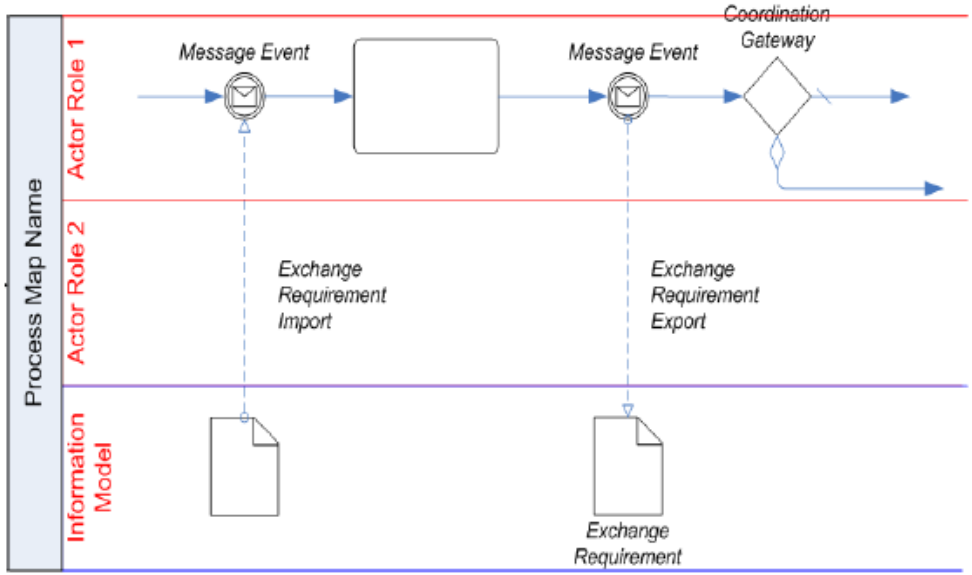
MVD

IDM process maps

IDM pools

This is intended to identify each project as an overall organization and each actor participating as a part of that organization.

Each process map is developed as a single ‘pool’.



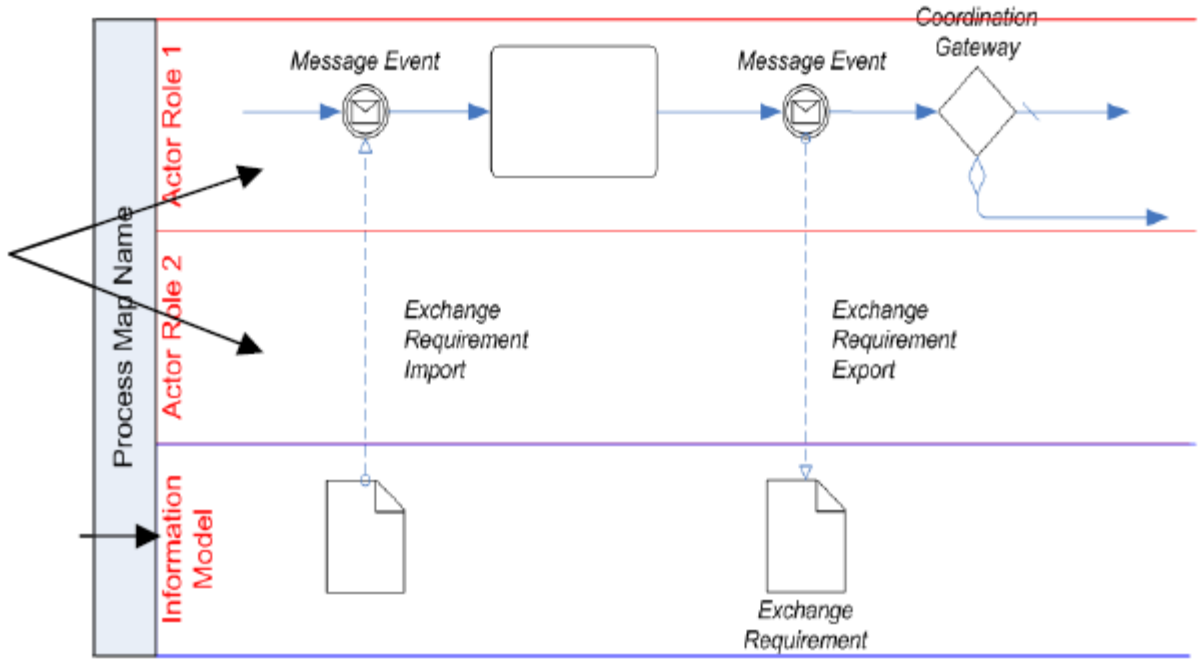
The name of the pool identifies the process map

Source: Jan Karlshøj, International IDM Coordinator based on material provided by AEC3.

IDM lanes

Activities for each actor are shown in individual swim lanes

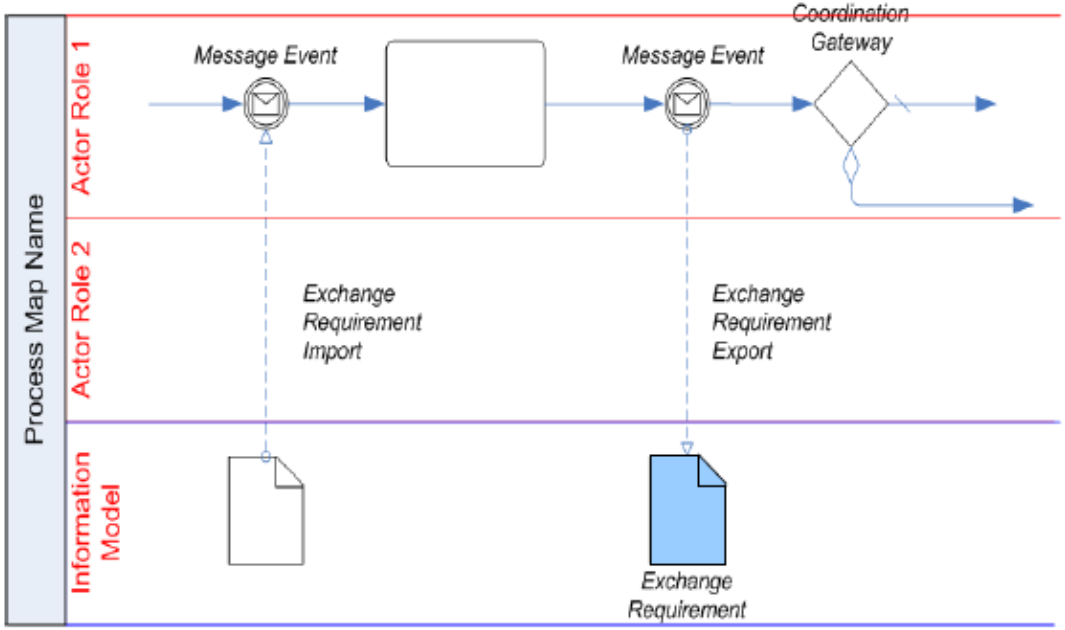
The ‘Information Model’ is shown as a separate actor role within its own swim lane.



Source: Jan Karlshøj, International IDM Coordinator based on material provided by AEC3.

Showing an Exchange requirement (ER)

An ‘Exchange Requirement’ is always shown in a process map as a data object within the Information Model swimlane.

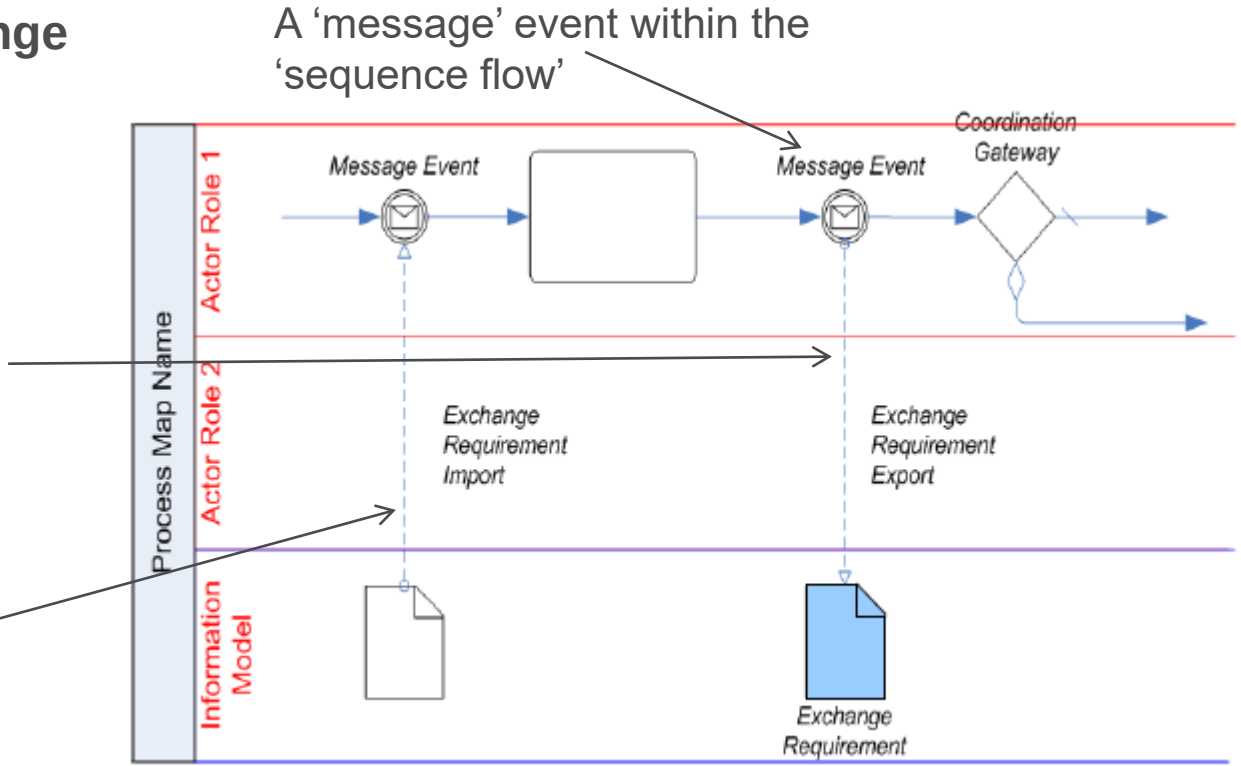


Source: Jan Karlshøj, International IDM Coordinator based on material provided by AEC3.

Providing an Exchange requirement (ER)

A message flow from the event to the Exchange Requirement data object

An Exchange Requirement used as input is shown in the same way.

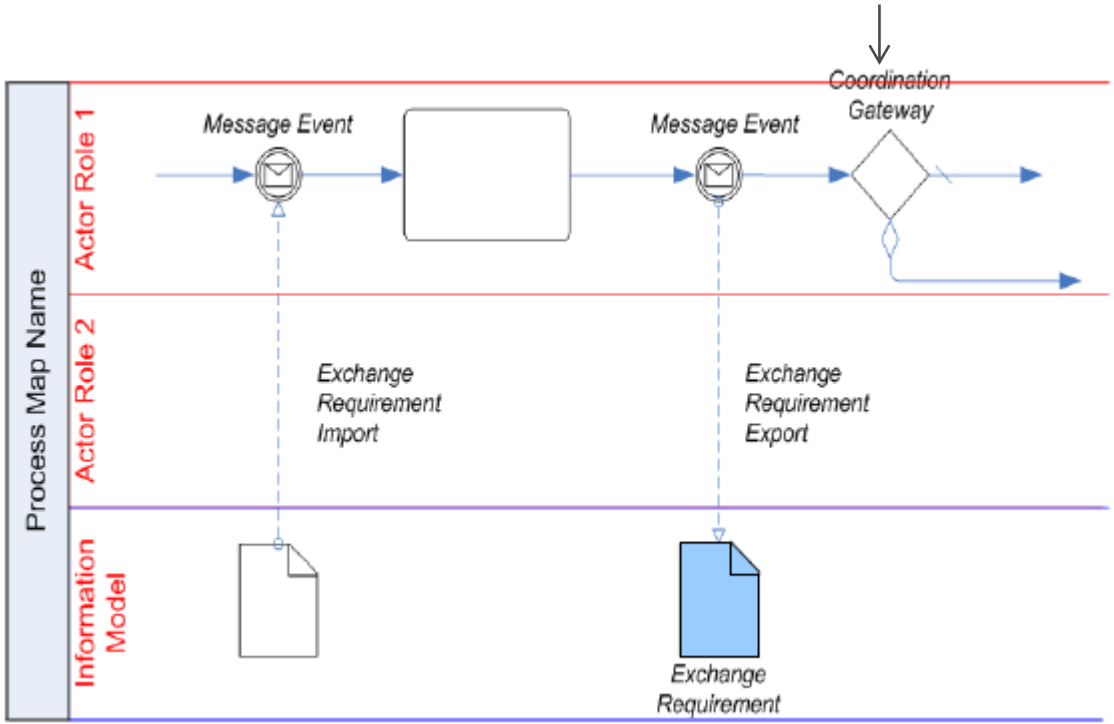


Source: Jan Karlshøj, International IDM Coordinator based on material provided by AEC3.

Coordination gateway

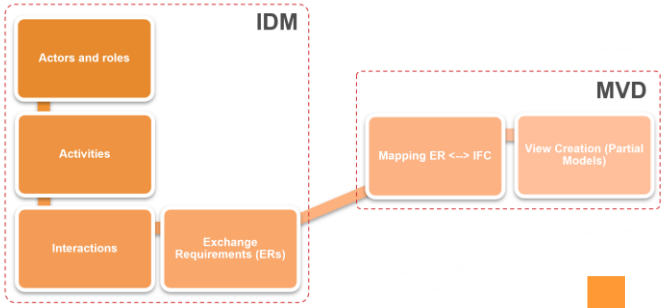
An Exchange Requirement export event is succeeded immediately by a ‘Coordination Gateway.

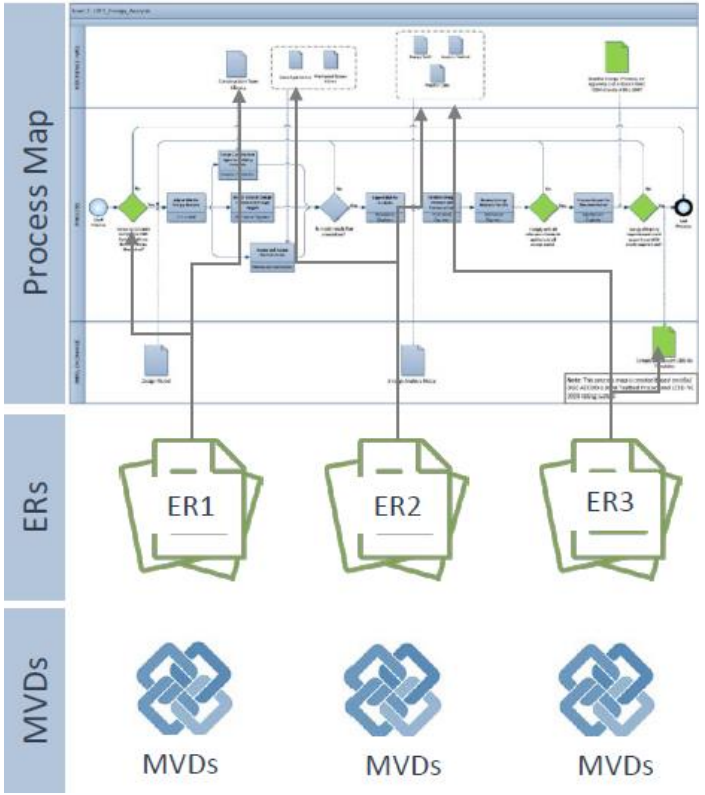
A Coordination Gateway is a point at which information from several exchange requirements may be brought together for examination, consideration or action



Source: Jan Karlshøj, International IDM Coordinator based on material provided by AEC3.

IDM, ER and MVD





Source: An IDM/MVD Configurator:Issues
Ghang LEE, Kahyun JEON, and SeungwooKang–Yonsei Univeristy
Mark BALDWIN –Mensch und Maschine
bSI Paris, 2018.

Questions

Project management in openBIM

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