ARCHITECTURE OF INTEGRATED INFORMATION SYSTEMS (ARIS)

ARIS ARCHITECTURE CONCEPT

The Architecture of integrated Information Systems (ARIS) is based on an integration concept derived from a holistic view of business processes.

The first step in creating the architecture is to develop a business process model containing all basic features for describing business processes. The result is a highly complex model, which is broken down into individual views so that its complexity is reduced. Due to this breakdown, it is possible to describe the content of individual views by special methods suitable for a specific view without having to pay attention to the numerous view interrelationships. The relationships between the views are incorporated in a final step and combined to form an overall overview of process chains without any redundancies.

ARIS ARCHITECTURE CONCEPT

A second approach that also reduces complexity is a differentiation via descriptions. Following the lifecycle concept, the various description methods for information systems are classified based on their proximity to information technology. This ensures a consistent description, from business management problems through to technical implementation.

Thus, the ARIS concept is a framework for developing and optimizing integrated information systems and for describing their implementation. As the emphasis lies on the technical descriptive level, the ARIS concept serves as a model for creating, analyzing, and evaluating business management process chains.

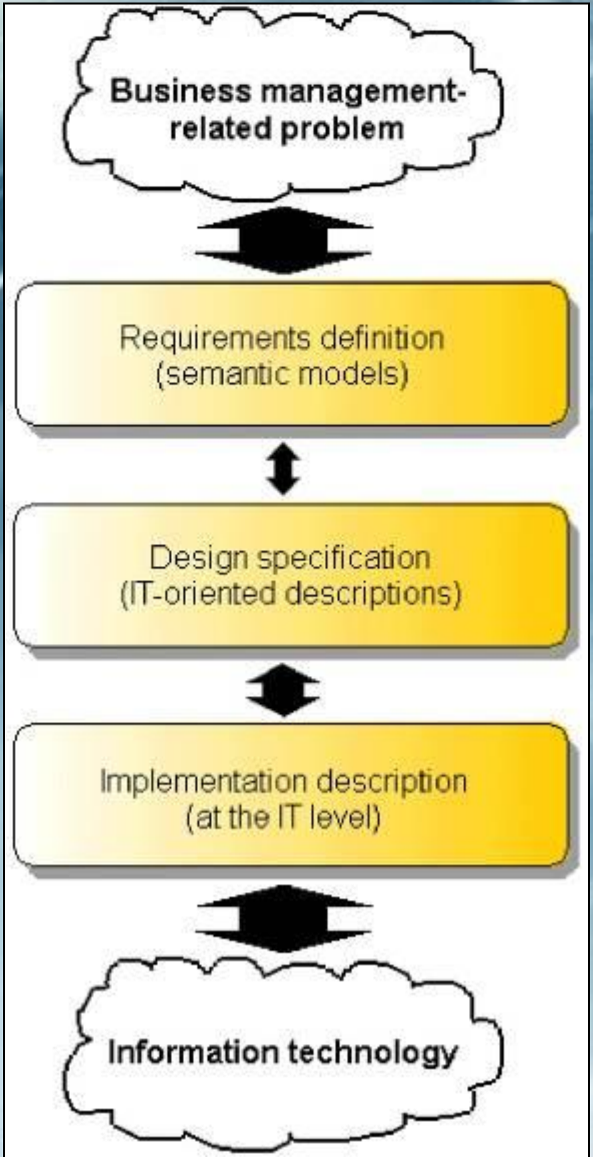
ARIS DESCRIPTIVE VIEWS

- Product/Service view describes relationships between products/services.
- Function view contains the description of the function, an enumeration of individual subfunctions that are part of the overall context, and the relationships that exist between the functions.
- Organization view subsumes users and organizational units, as well as their relationships and structures.

ARIS DESCRIPTIVE VIEWS

- Resource view provides general conditions for describing other components that are more directly geared toward business management. For this reason, the components of the other views are described in terms of their proximity to the information technology resources. Thus, resources are dealt with at the design specification and implementation level of the other views. The lifecycle model that is defined as a result of the descriptive level approach replaces the resource view as an independent object of consideration.
- Control view is provided as an additional view for describing the relationships between views. Combining these relationships in a separate view allows for systematic and redundancy-free recording of all relationships. The control view is an essential component of ARIS which distinguishes it from other architecture approaches.

DESCRIPTIONS OF AN INFORMATION SYSTEM



Business management-related problem

Requirements definition (semantic models)

Design specification (IT-oriented descriptions)

Implementation description (at the IT level)

Information technology

DESCRIPTION OF THE BUSINESS MANAGEMENT PROBLEM

Individual objects or areas of consideration are modeled within the ARIS architecture (views and levels) based on the initial business situation, i. e., the business management problem.

The description mentions the weak points that information systems currently used do have in terms of the support they provide for existing business processes and also includes the main content of the target concept for the system to be developed. The target concept in turn reflects the objectives pursued by using new information systems.

The model uses for describing the business management problem must have the ability of recording as many facts as possible from the data, function, and organization views, including their interrelationships.

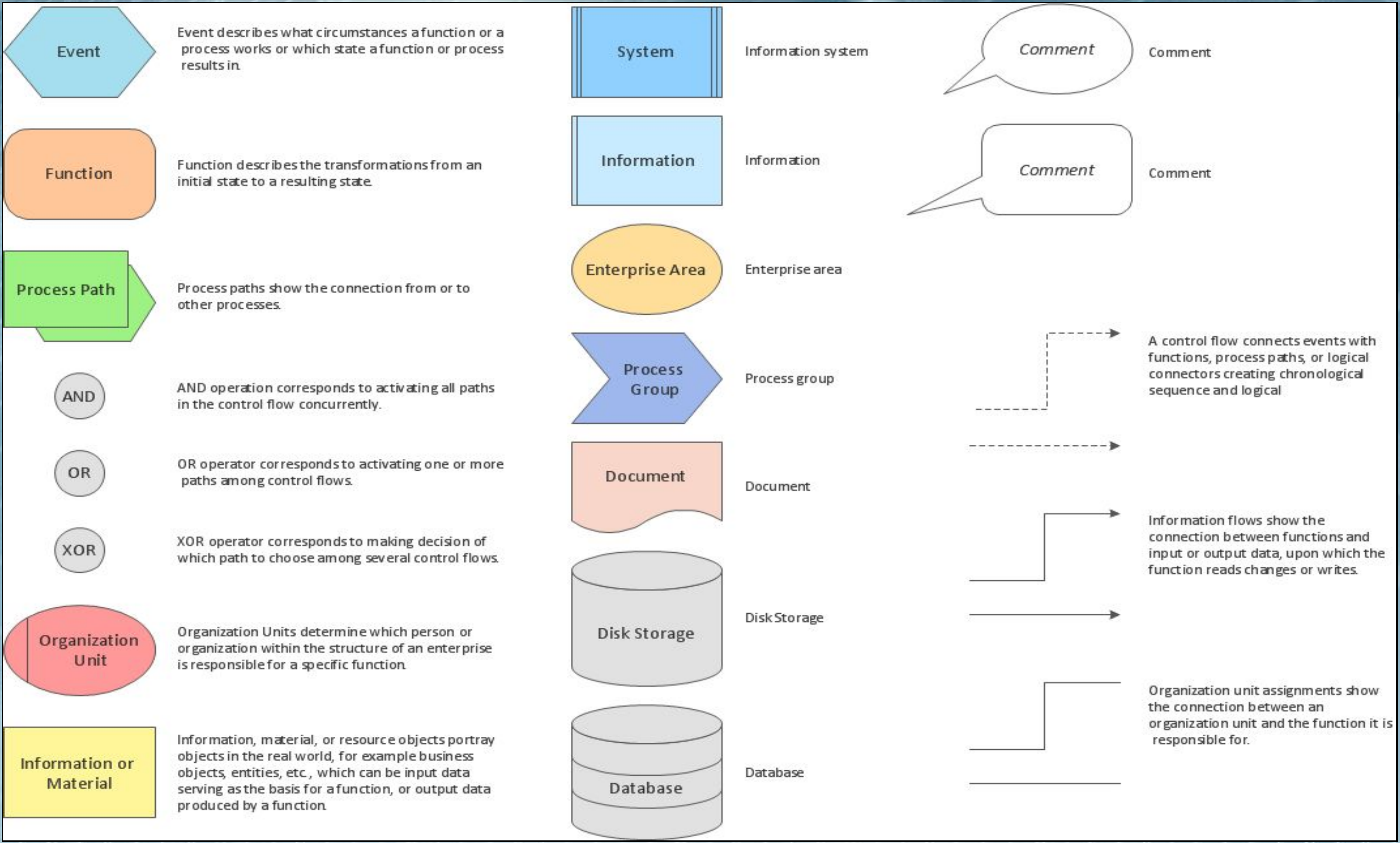
PROCESS CHAIN DIAGRAM (PCD)

A process chain diagram represents a closed process chain.

All views of a business process (organization view, data view, function view, resource view) are expressed with their relationships in a coherent form.

The two columns on the left represent the chronological-logical operational sequence of the business process under consideration. Individual functions of the procedure are listed in the second column and linked to the events by which they are triggered and which they generate. The connections between functions and events define exactly which events trigger functions and which events are generated by functions and thus regulate the control flow between functions.

DESIGN ELEMENTS FOR PROCESS CHAIN DIAGRAM



Event describes what circumstances a function or a process works or which state a function or process results in.

Function describes the transformations from an initial state to a resulting state.

Process paths show the connection from or to other processes.

AND operation corresponds to activating all paths in the control flow concurrently.

OR operator corresponds to activating one or more paths among control flows.

XOR operator corresponds to making decision of which path to choose among several control flows.

Organization Units determine which person or organization within the structure of an enterprise is responsible for a specific function.

Information, material, or resource objects portray objects in the real world, for example business objects, entities, etc., which can be input data serving as the basis for a function, or output data produced by a function.

Information system

Information

Enterprise area

Process group

Document

Disk Storage

Database

Comment

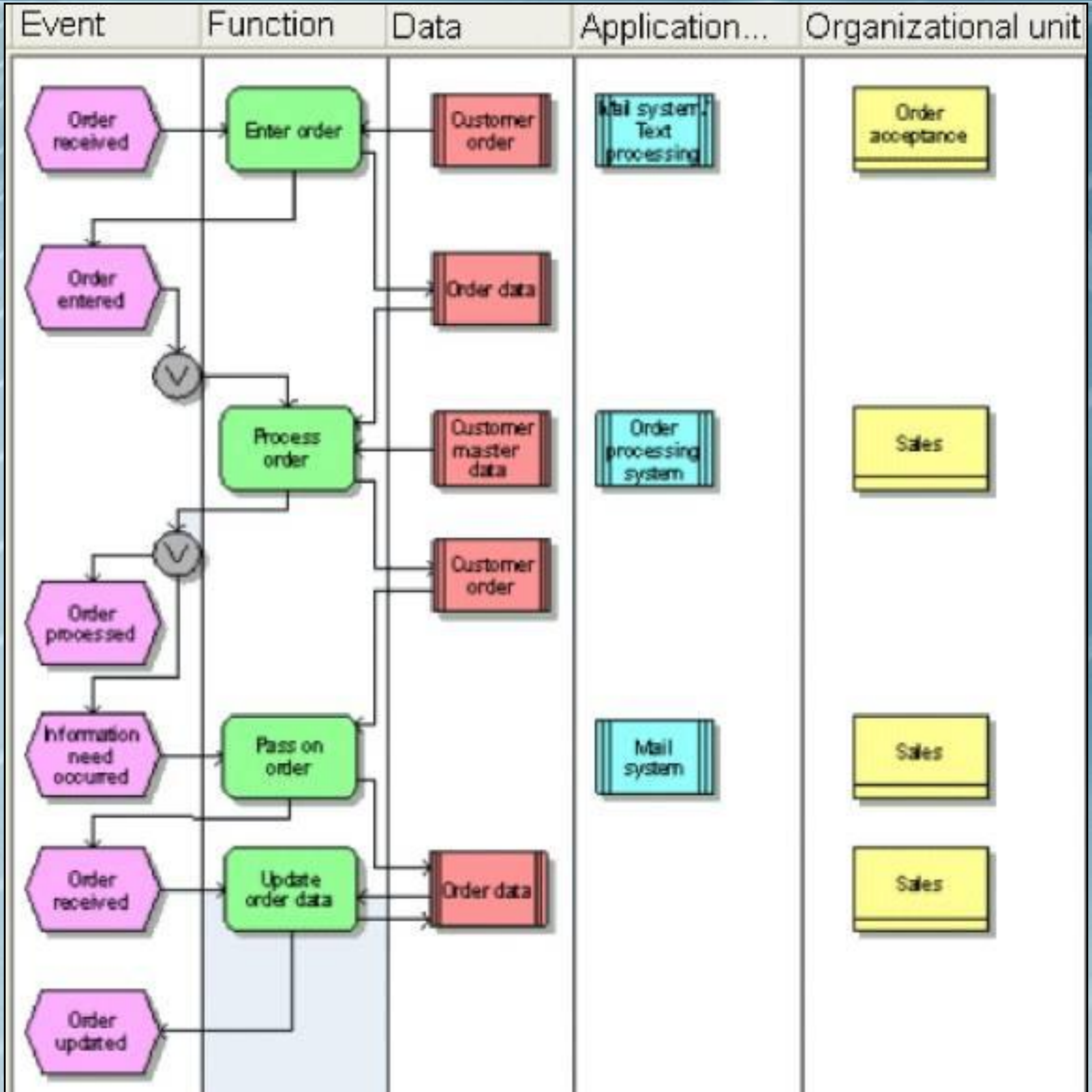
Comment

A control flow connects events with functions, process paths, or logical connectors creating chronological sequence and logical

Information flows show the connection between functions and input or output data, upon which the function reads changes or writes.

Organization unit assignments show the connection between an organization unit and the function it is responsible for.

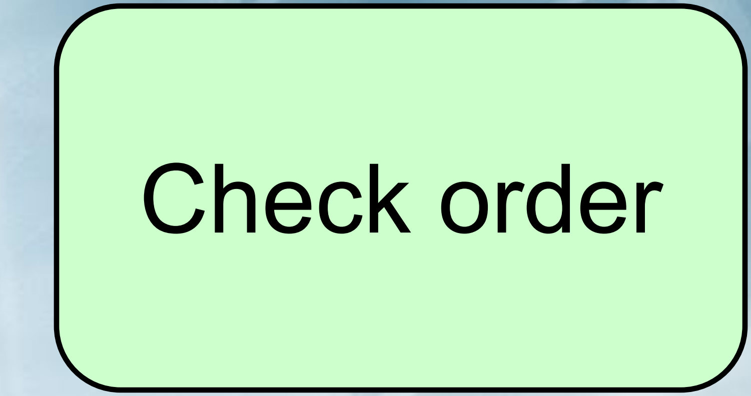
PROCESS CHAIN DIAGRAM (EXAMPLE)



FUNCTION VIEW

The ARIS architecture strictly separates the various areas of consideration. The function view covers only those means of representation that show the interconnections between functions. Relationships between functions and data are displayed in the ARIS process view.

A function is a technical task or activity performed for an object to support one or more business objectives. Mostly a noun is used as the function name. Functions are displayed as rectangles with rounded corners:



Check order

FUNCTION TREE

Functions can be described at different aggregation levels. Accumulations of functions in the form of business processes or process chains form the top level of aggregation.

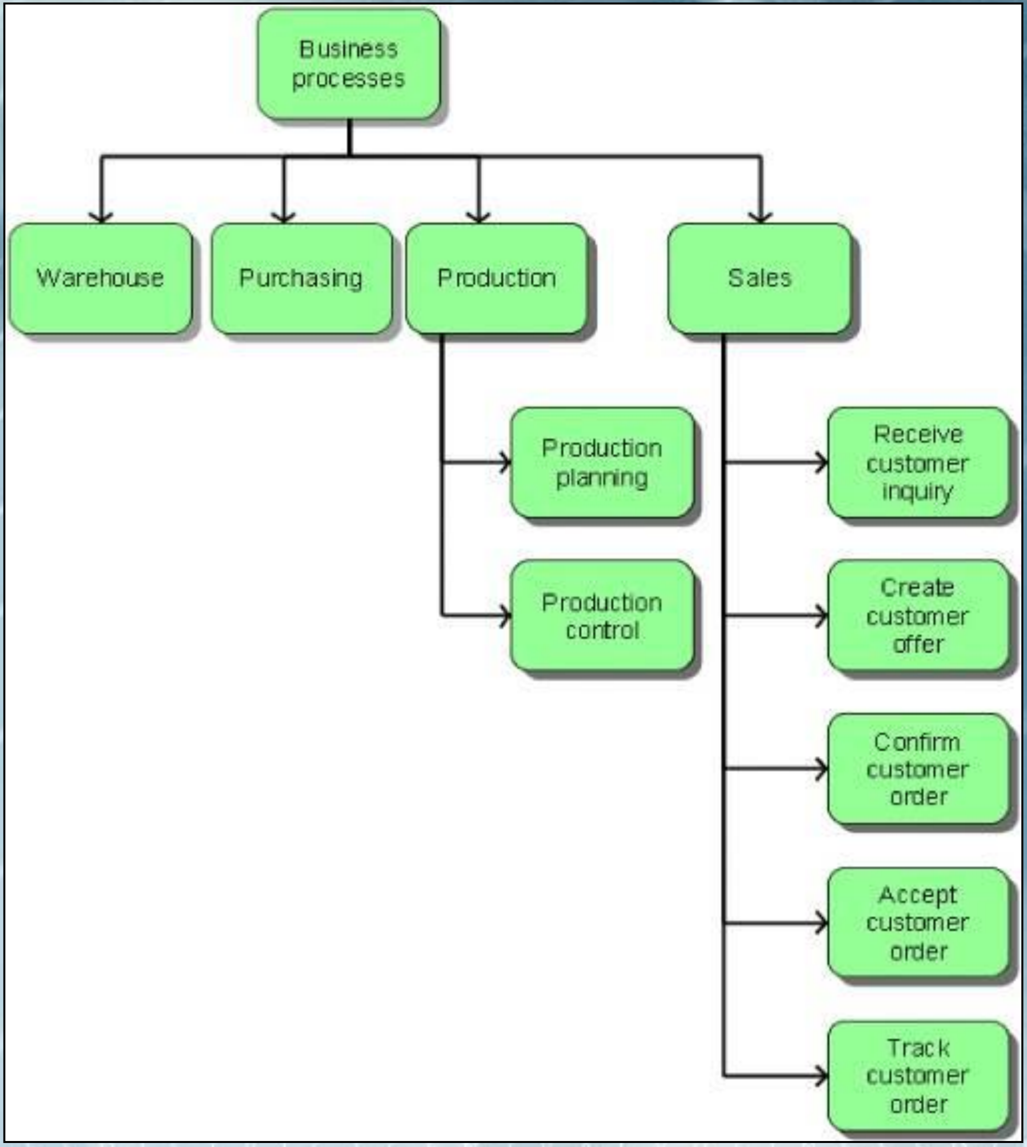
A business process thus represents a complex function that can be broken down into subfunctions to reduce its complexity.

The term “function” can be used at all hierarchy levels. However, other terms, such as procedure, process, subfunction, or elementary function, are also used to indicate the hierarchy level.

Breaking down functions can be done across multiple hierarchy levels.

Elementary functions represent the lowest level in semantic function trees. Elementary functions are functions that, from the business management point of view, cannot be broken down any further.

EXAMPLE OF THE FUNCTION TREE



Business processes

Warehouse

Purchasing

Production

Sales

Production planning

Production control

Receive customer inquiry

Create customer offer

Confirm customer order

Accept customer order

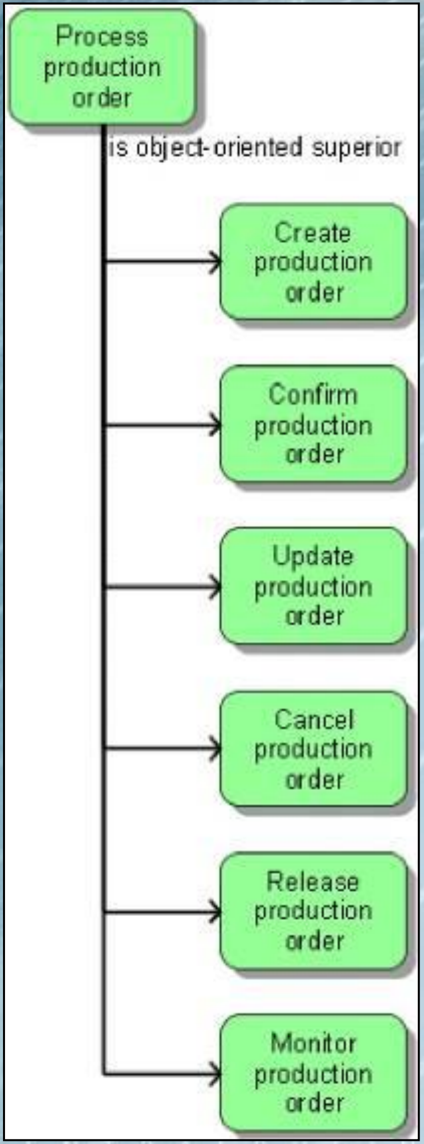
Track customer order

GROUPING FUNCTIONS

Grouping functions within a function tree can be performed according to different criteria:

- object-oriented – processing of the same object
- process-oriented – breakdown according to process affiliation (is recommended for function trees that represent the results of business process modeling)
- execution-oriented – means that all functions performing the same operation for different information objects are grouped together

GROUPING FUNCTIONS (EXAMPLES)



Process production order

is object-oriented superior

Create production order

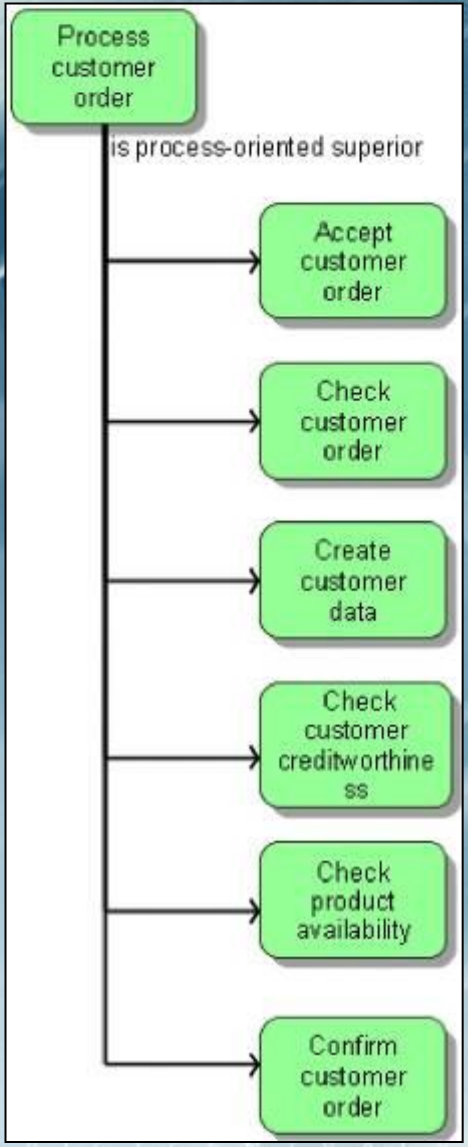
Confirm production order

Update production order

Cancel production order

Release production order

Monitor production order



Process customer order

is process-oriented superior

Accept customer order

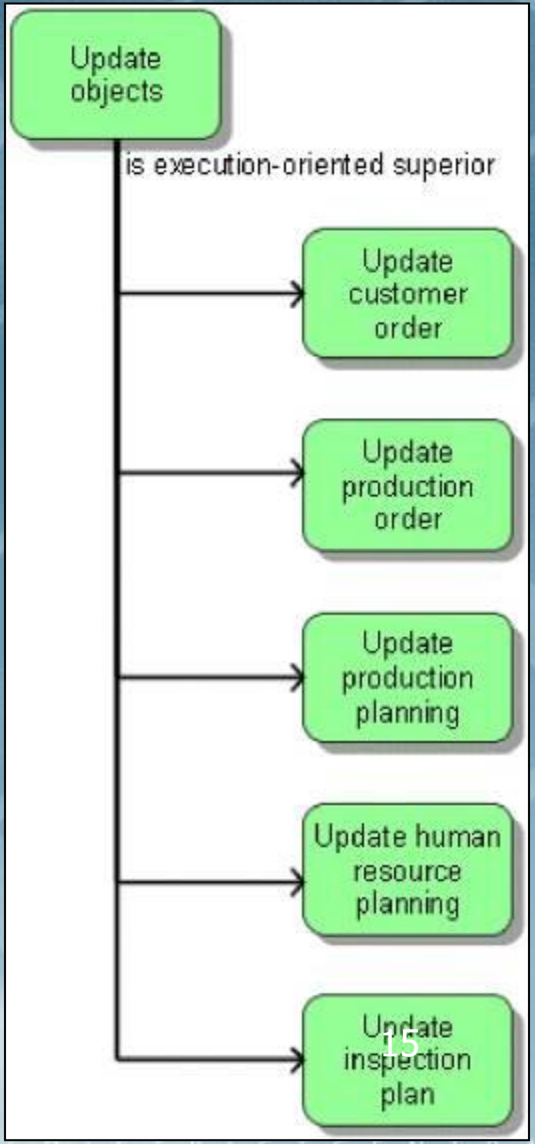
Check customer order

Create customer data

Check customer creditworthiness

Check product availability

Confirm customer order



Update objects

is execution-oriented superior

Update customer order

Update production order

Update production planning

Update human resource planning

Update inspection plan

DESIGN SPECIFICATION – APPLICATION SYSTEM TYPE DIAGRAM

The design specification of the function view contains the specification for the application system and module types, as well as the modular structure of the application system type, an outline of individual transaction steps, and the definition of input and output presentations in the form of draft lists and screen designs. Key questions to which the design specification of the function view provides answers are:

- How can application system types, module types, or IT functions support the functions defined in the requirements definition?
- What is the modular structure of application system types or module types?
- Which lists and screens are required to carry out a function?

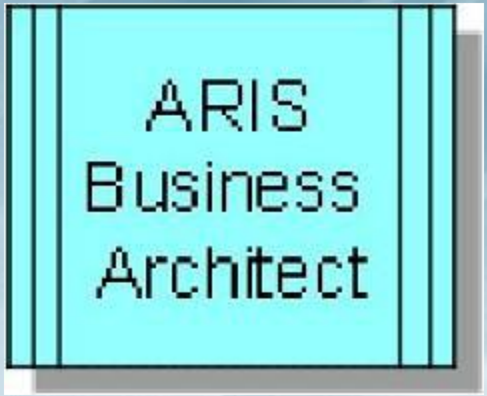
DESIGN SPECIFICATION – APPLICATION SYSTEM TYPE DIAGRAM

- ✓ Which lists can be created with an application system type or a module type, and which screens do application system types and module types use?
- ✓ What technology (operating system, user interface, database management system) is an application system type based on?
- ✓ Which business objectives are pursued when a specific application system type is used?

DESIGN SPECIFICATION – APPLICATION SYSTEM TYPE DIAGRAM

The Application system type is the key object type of the function view's design specification. Unlike concrete application systems that come into play only at the implementation level of the function view and that represent specific, identifiable (e.g., by a license number) application systems within a company, application system types are generated as the result of typifying all application systems that are based on precisely the same technology.

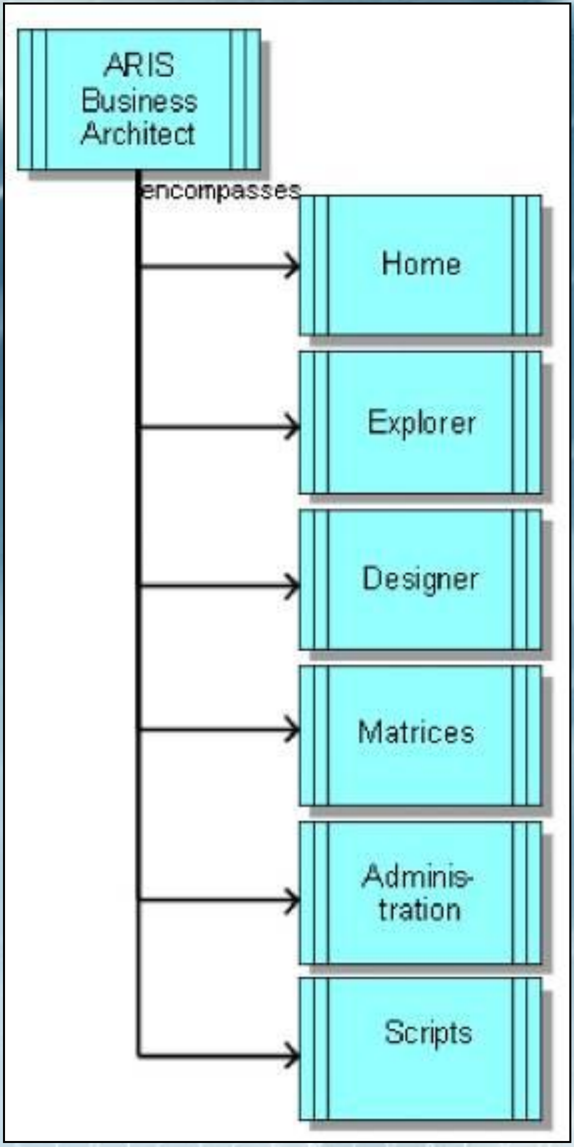
Application system types are represented by the following graphic symbol:



APPLICATION MODULS TYPE

As with application system types, module types typify individual modules that are based on precisely the same technology. Module types are components of application system types. They are capable of autonomous operation. A module type is a component of an application system type, which is capable of autonomous operation. Module types typify individual modules that are based on precisely the same technology.

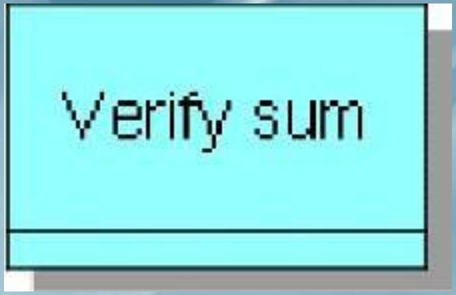
MODULAR STRUCTURE OF AN APPLICATION SYSTEM TYPE



APPLICATION MODULS TYPE

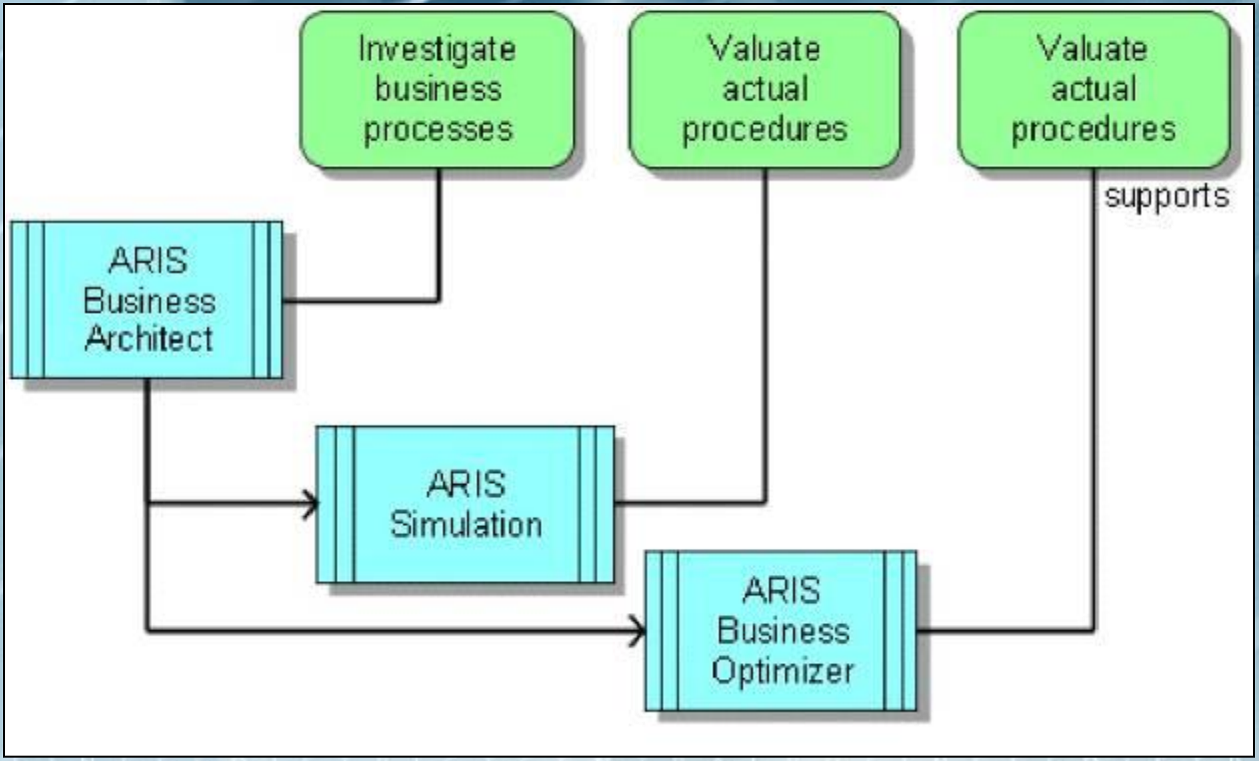
Application system types and module types can be arranged in any hierarchy. At the lowest level, module types can be divided into IT function types.

An IT function type, in the sense of a transaction, is the smallest unit of a module type. IT function types are realized as individual program modules and must always be carried out completely to process an individual work step. Graphical representation of an IT function type:



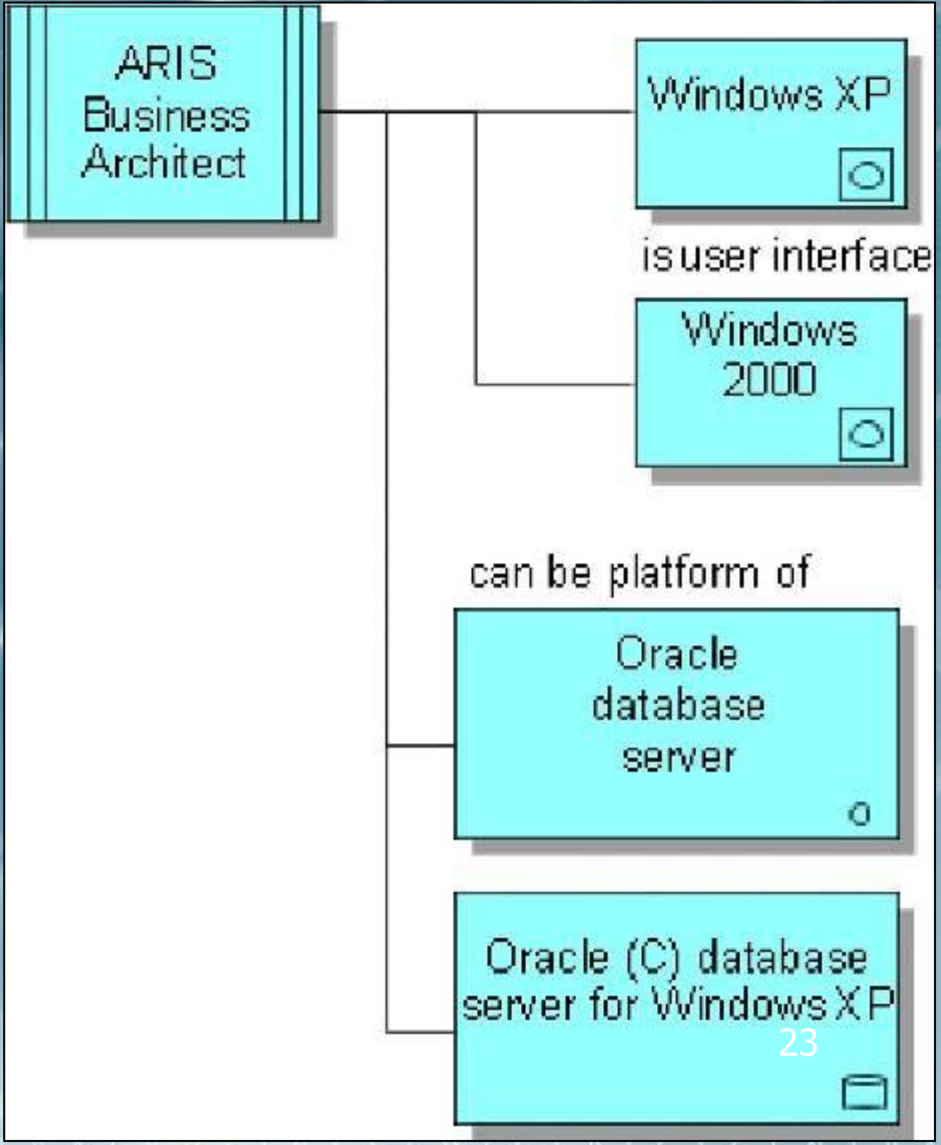
ALLOCATION OF FUNCTIONS TO APPLICATION SYSTEM TYPES

The application system type diagram is also a means of defining the functions of the requirements definition that are supported by the specified application system types and module types. This assignment forms the link between the requirements definition and the design specification of the function view.


Investigate business processes
Valuate actual procedures
Valuate actual procedures
supports
ARIS Business Architect
ARIS Simulation
ARIS Business Optimizer

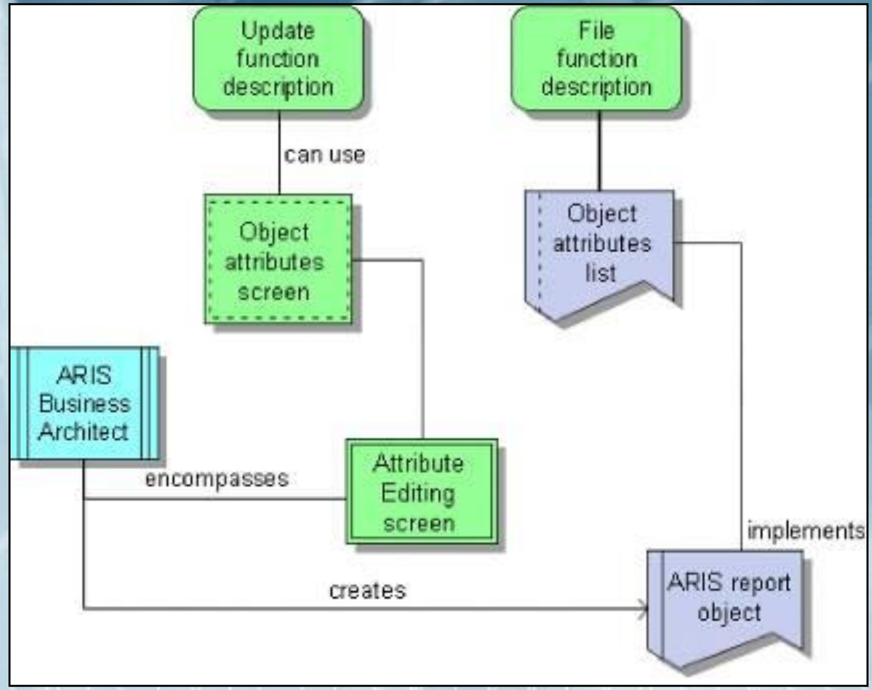
APPLICATION SYSTEM TYPE CONFIGURATION

To obtain a more detailed specification of the technology that application system types and module types are based on, it is possible to allocate to them the types of user interfaces, database management systems, and operating systems under which they can run, as well as the programming languages that are used to implement them. As this concerns types and not concrete specimens, multiple relationships are possible.



SCREEN AND LIST ASSIGNMENTS

Processing a technical function with the support of an application system involves the use of various screens and the creation or use of various lists provided by the corresponding application system. For this purpose, the List and Screen objects are available and can be assigned to either the technical function or the application system types and module types.

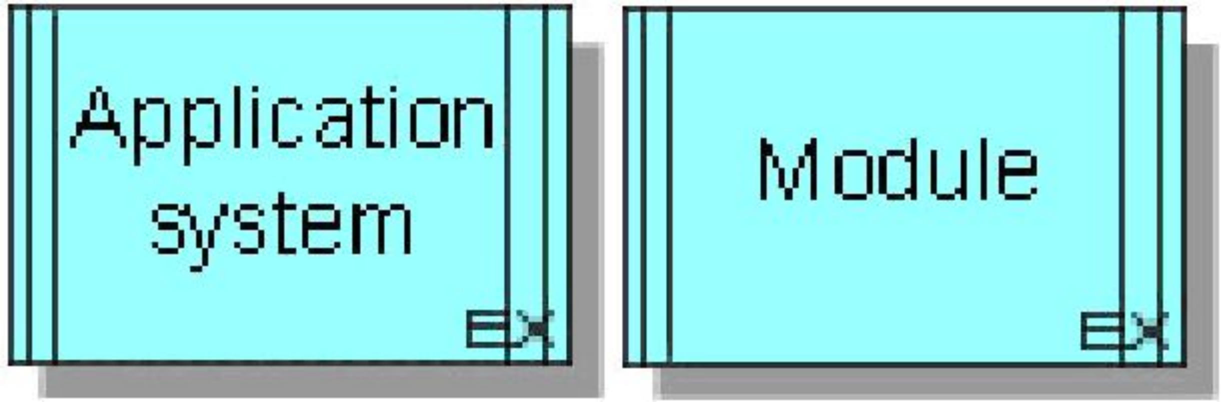


IMPLEMENTATION – APPLICATION SYSTEM TYPE DIAGRAM

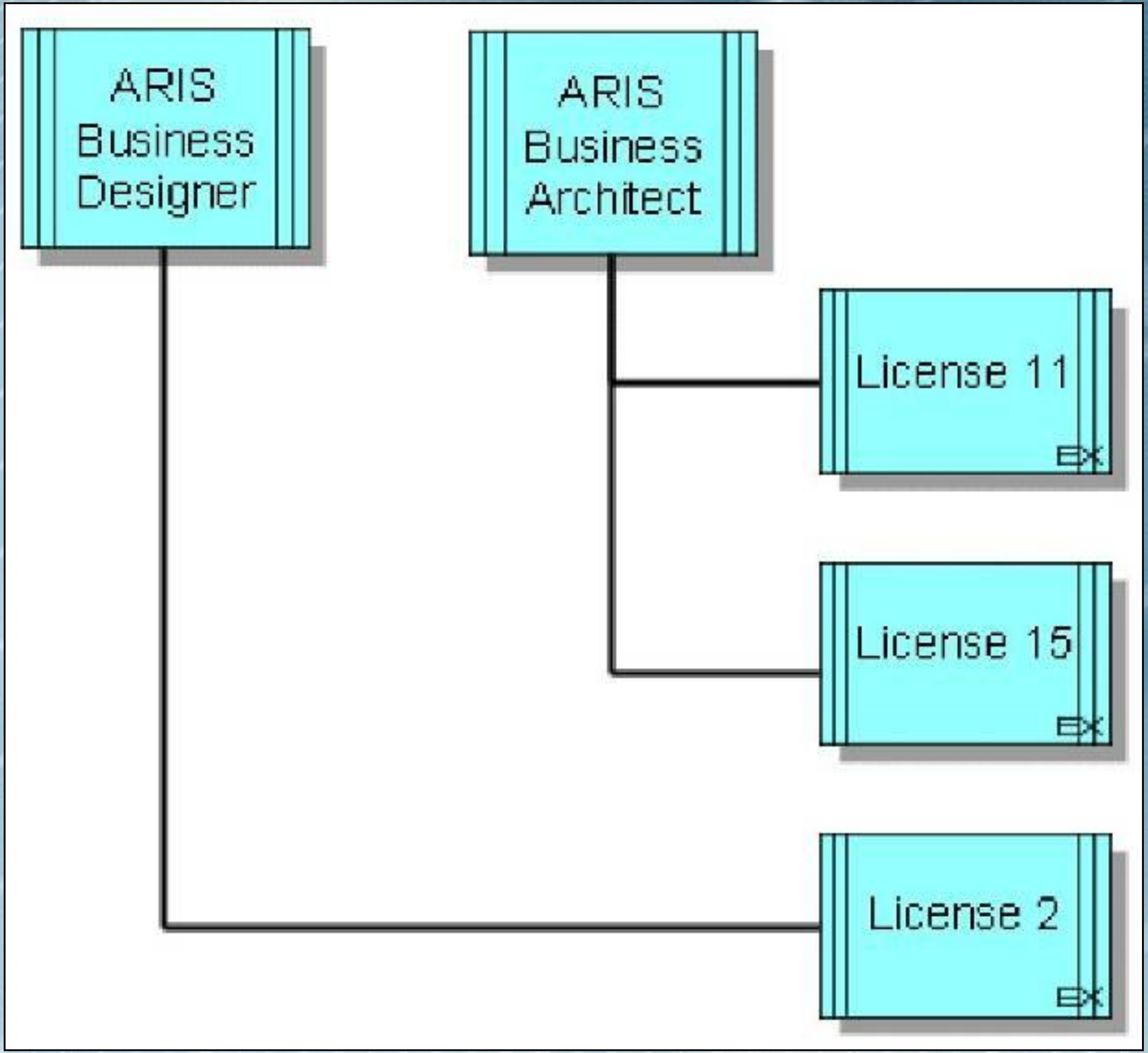
In the application system type diagram can be assigned specific application systems and modules to the application system types and module types described in the design specification.

An application system (module) is an individual specimen of an application system type (module type), which can be uniquely identified, e.g., by the license number.

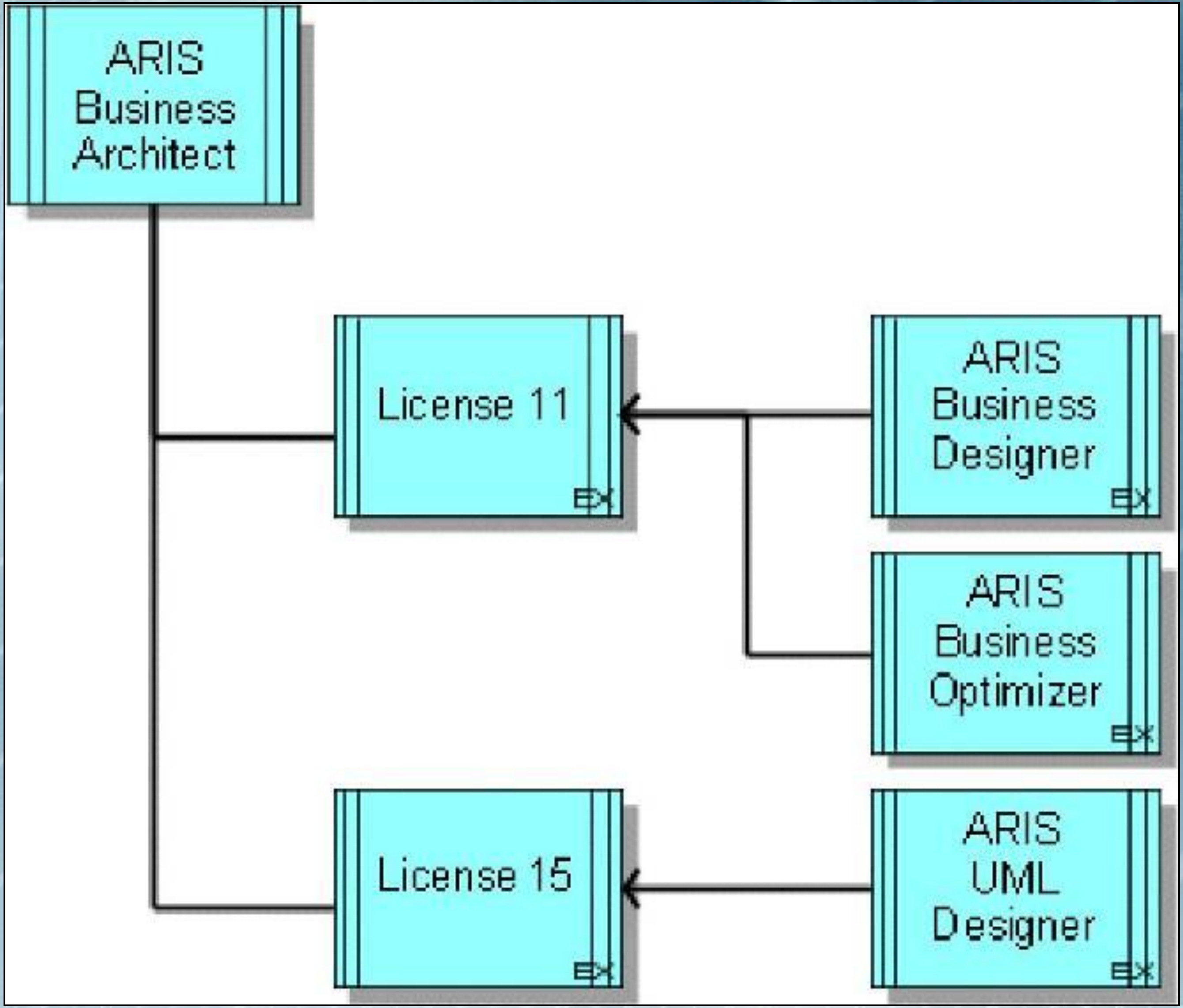
Application systems and modules are displayed graphically:



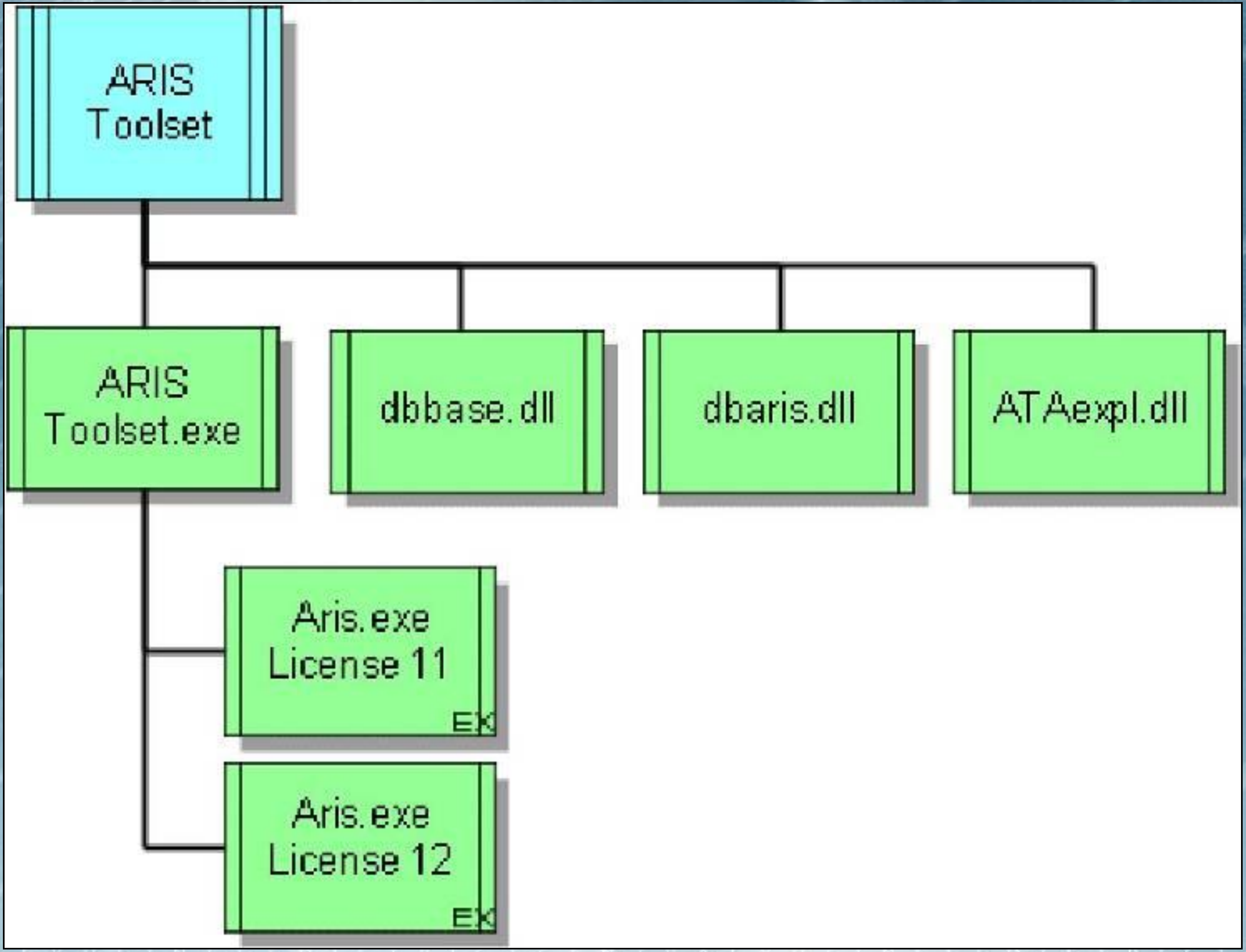
ASSIGNMENT OF APPLICATION SYSTEMS TO THEIR APPLICATION SYSTEM TYPES



DIFFERENT MODULAR STRUCTURE OF TWO APPLICATION SYSTEMS OF THE SAME TYPE



ASSIGNMENT OF APPLICATION SYSTEM TYPES, PROGRAM MODULE TYPES, AND PROGRAM MODULES



ARIS Toolset

ARIS Toolset.exe

dbbase.dll

dbaris.dll

ATAexpl.dll

Aris.exe License 11

EX

Aris.exe License 12

EX

DATA VIEW

The requirements definition of the data view includes a description of the semantic data model of the area of consideration. In line with the breakdown approach stipulated by ARIS, the description covers both the objects that specify the start and end events of a process chain and the current state of the relevant process chain environment.

Unlike function modeling, data modeling is particularly demanding as far as the method is concerned. In the function view, the only object examined is the function. Furthermore, relationships between functions simply illustrate superordination or subordination.

ENTITY-RELATIONSHIP MODEL (ERM)

Entity-Relationship Model (ERM) is the most widely used designing method for semantic data models (Chen, The Entity-Relationship Model, 1976). This modeling method uses a variety of specialized terms, such as entity type, relationship type, attribute, etc.

The base model distinguishes between entities, attributes, and relationships. Basically, a difference is made between type level and occurrence level.

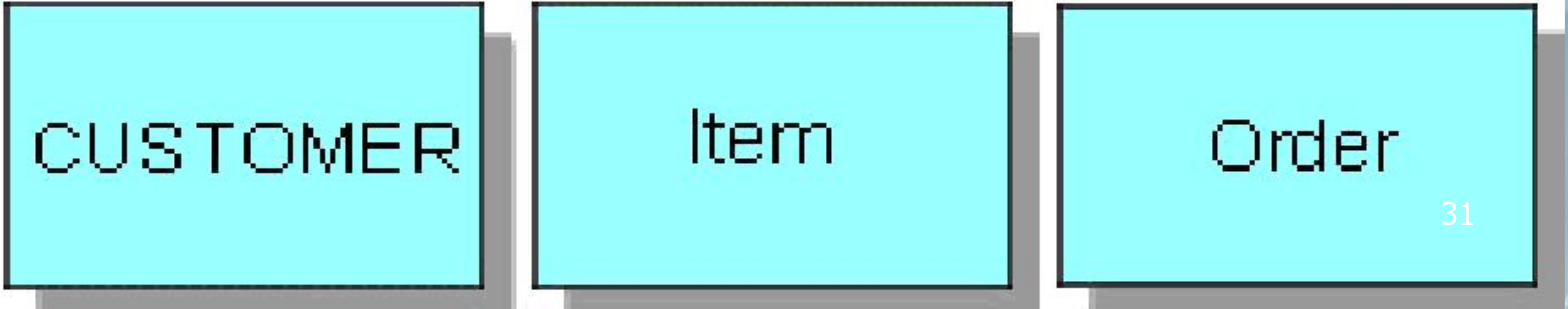
ENTITIES

Entities are real or abstract objects that are relevant for the business management tasks being examined. For example, an object of consideration may be a business process.

Entities are described in more detail by means of specific attributes (properties). For example, a customer can be specified more precisely by his name, first name, and address. If similar entities are grouped into sets, these are referred to as entity types, the individual occurrences of which are the entities.

Entities of a similar type can be described by the same attributes.

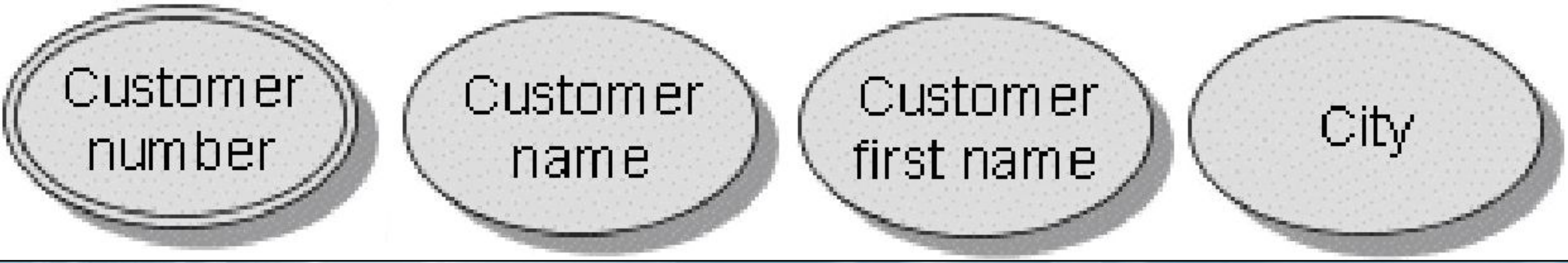
Entity types are displayed as rectangles.



ATTRIBUTES

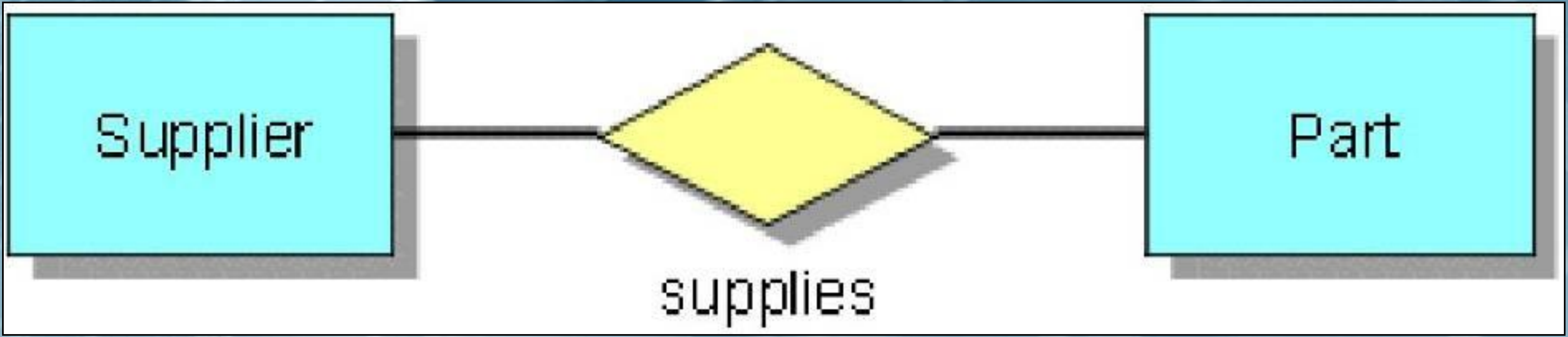
Attributes are properties describing entity types. Attribute occurrences are specific values of attributes of individual entities. For example, the customer can be described by attribute occurrences such as *Miller, Peter,* and *Munich*. The relevant attributes are *Name, First name*, and *City*.

Attributes are usually represented by an oval or a circle.



RELATIONSHIPS

A relationship is a logical link between entities. Therefore, the existence of relationships directly depends on the existence of entities. If similar relationships are grouped into sets, these are referred to as relationship types. In an ERM, relationship types are displayed as diamonds and are linked with entity types via connections.

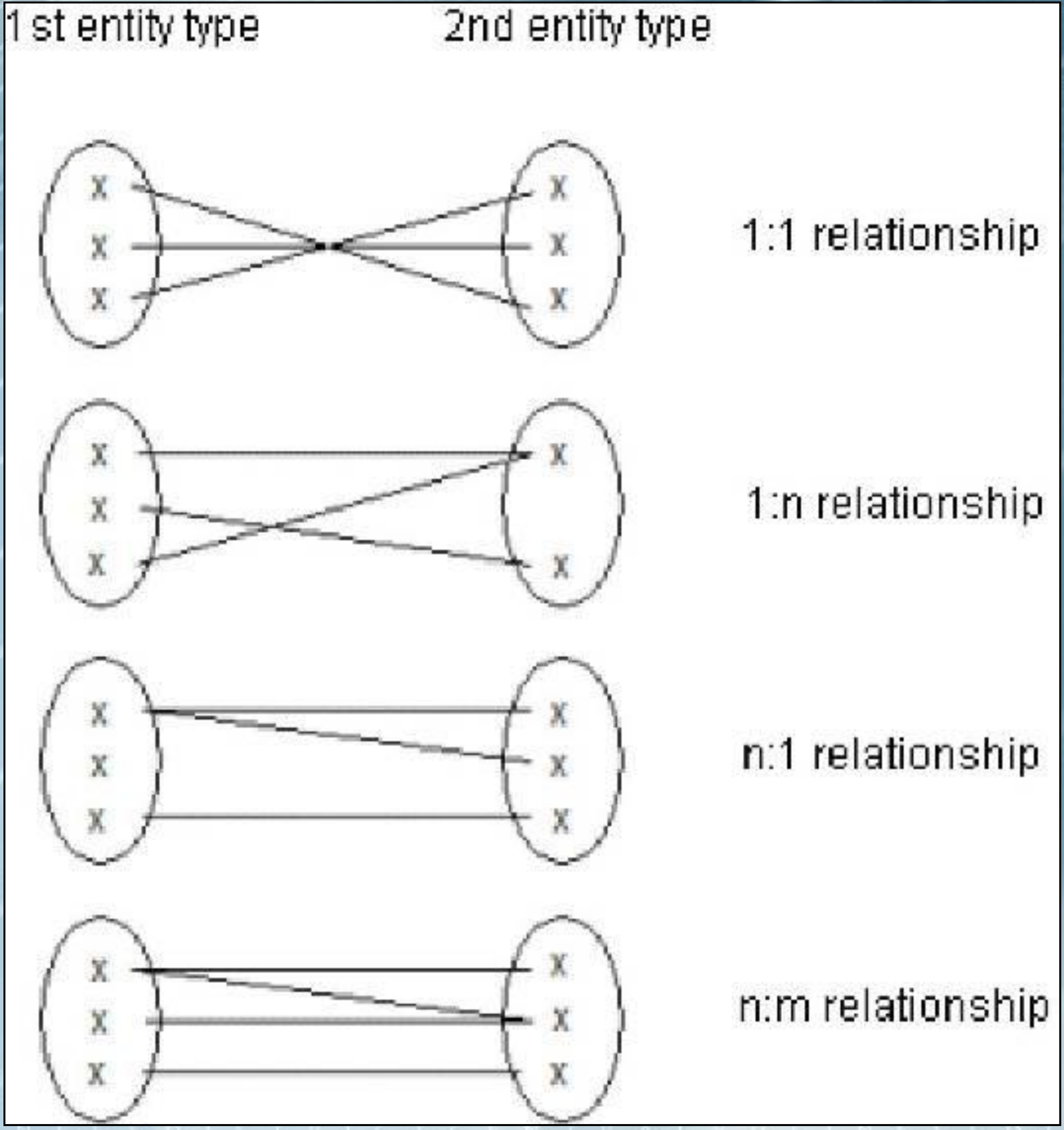


CARDINALITIES OF RELATIONSHIPS BETWEEN TWO ENTITY TYPES

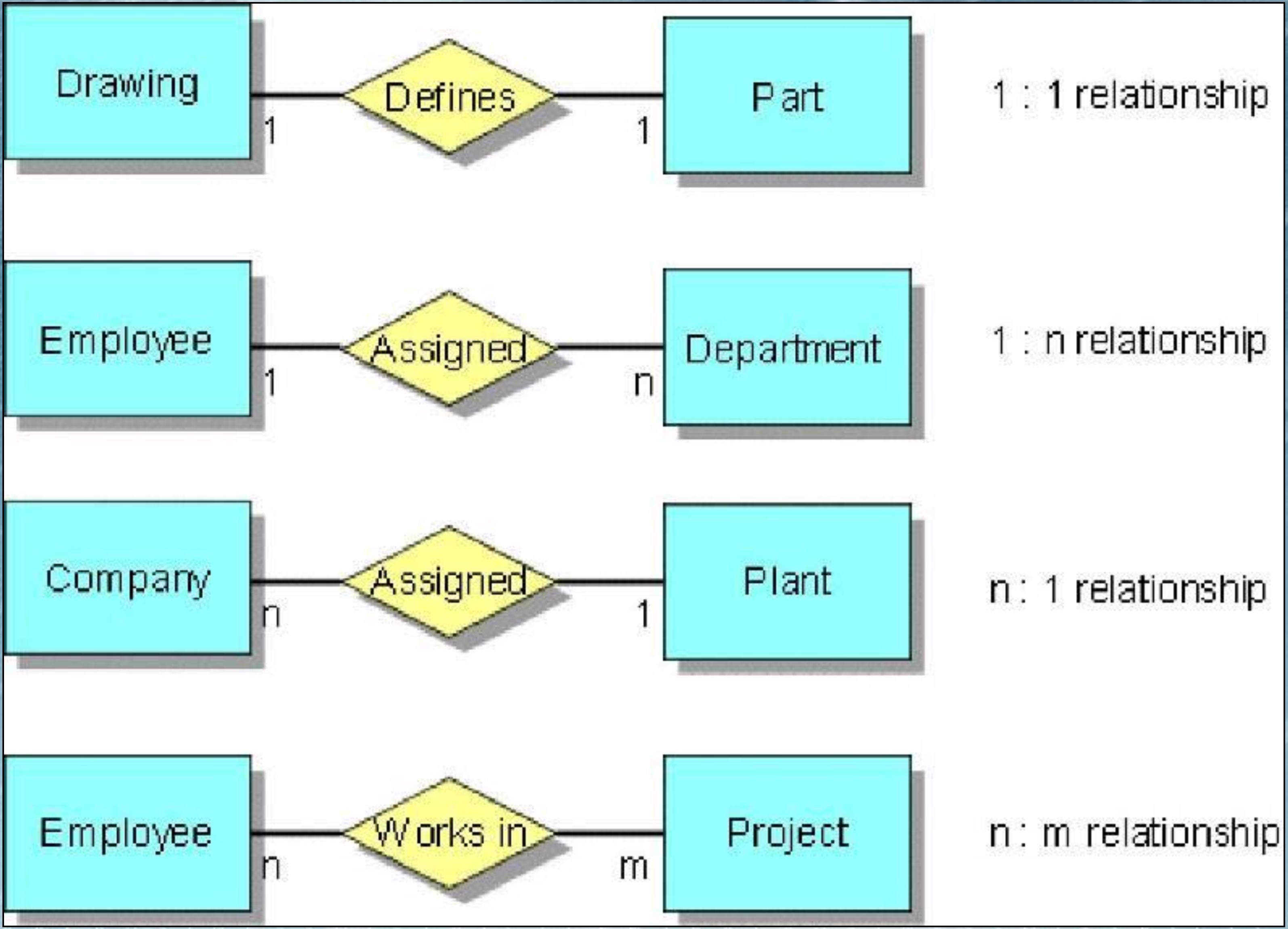
Four different types of relationships (cardinalities) can be pointed out:

- ✔ 1:1 relationship – each entity of the first set is assigned to exactly one entity of the second set
- ✔ 1:n relationship – each entity of the first set is assigned to exactly one entity of the second set, but each entity of the second set may be connected with various entities of the first set
- ✔ n:1 relationship – means the same, but in reverse order
- ✔ n:m relationship – multiple entities of the second set are assigned to each entity of the first set and vice versa

CARDINALITIES OF RELATIONSHIPS BETWEEN TWO ENTITY TYPES

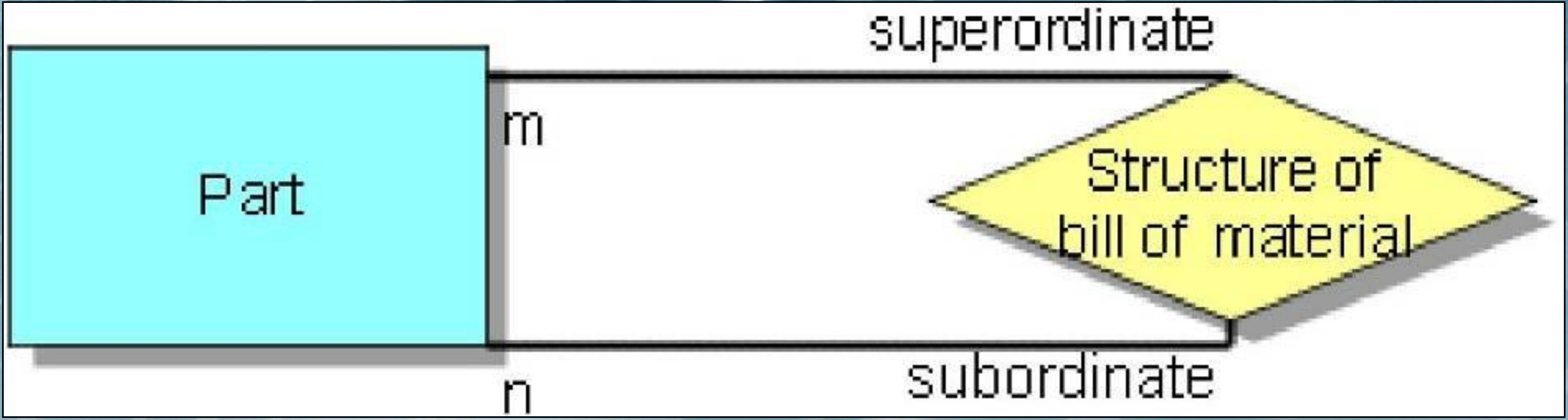


REPRESENTATION OF CARDINALITIES IN THE ERM

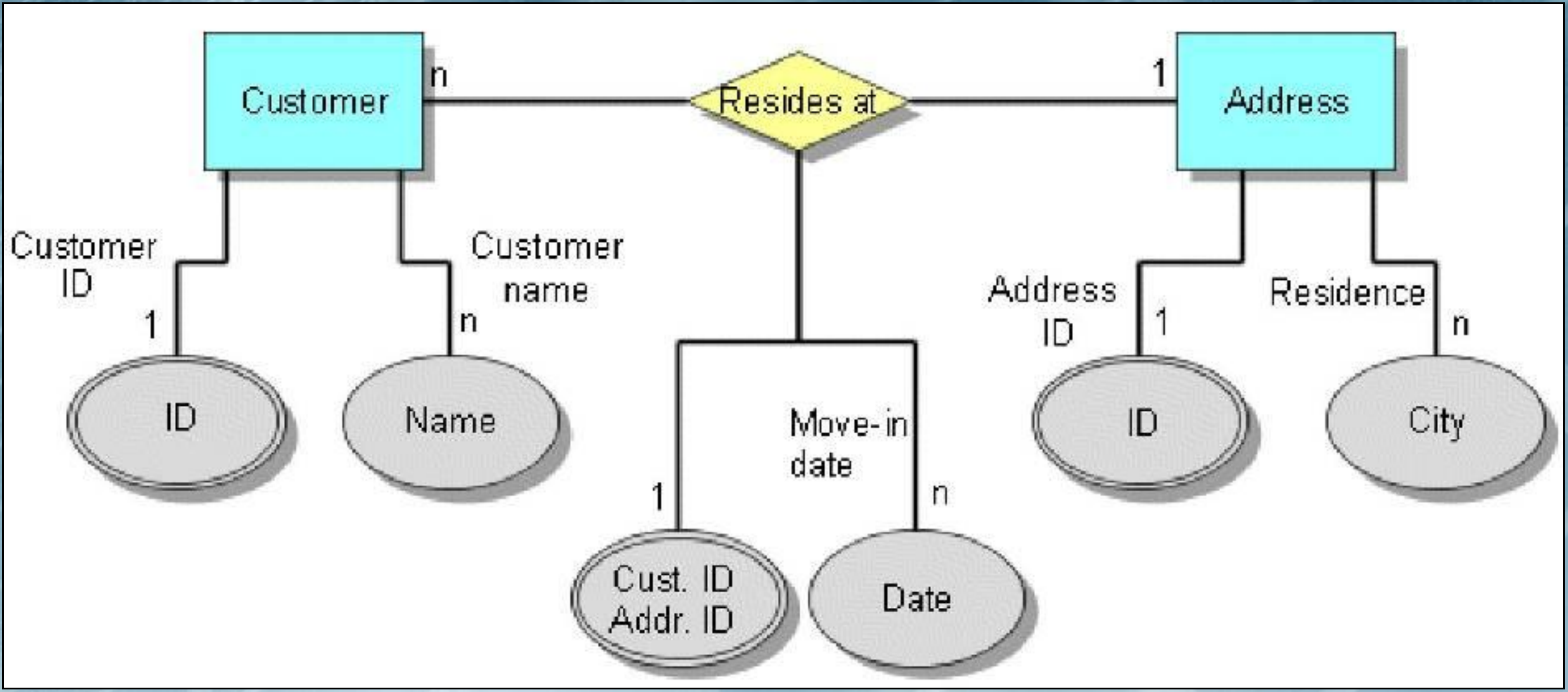


REPRESENTATION OF CARDINALITIES IN THE ERM

Due to the fact that relationships between entities of one entity type are allowed, two parallel connections may exist between an entity type and a relationship type. These connections may be distinguished by assigning role names.



REPRESENTATION OF CARDINALITIES IN THE ERM



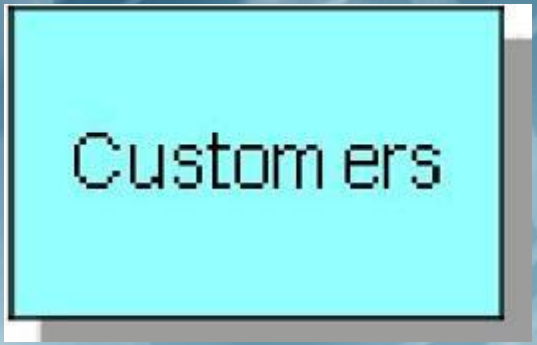
eERM EXTENSIONS

For extending ERM modeling, four basic design operators have become accepted:

- Classification
- Generalization
- Aggregation
- Grouping

CLASSIFICATION

Through classification, objects (entities) of the same type are identified and assigned to a term (entity type). Two objects are identical if the same properties (attributes) are used to describe them. Classification thus results in the previously described identification of entity types.



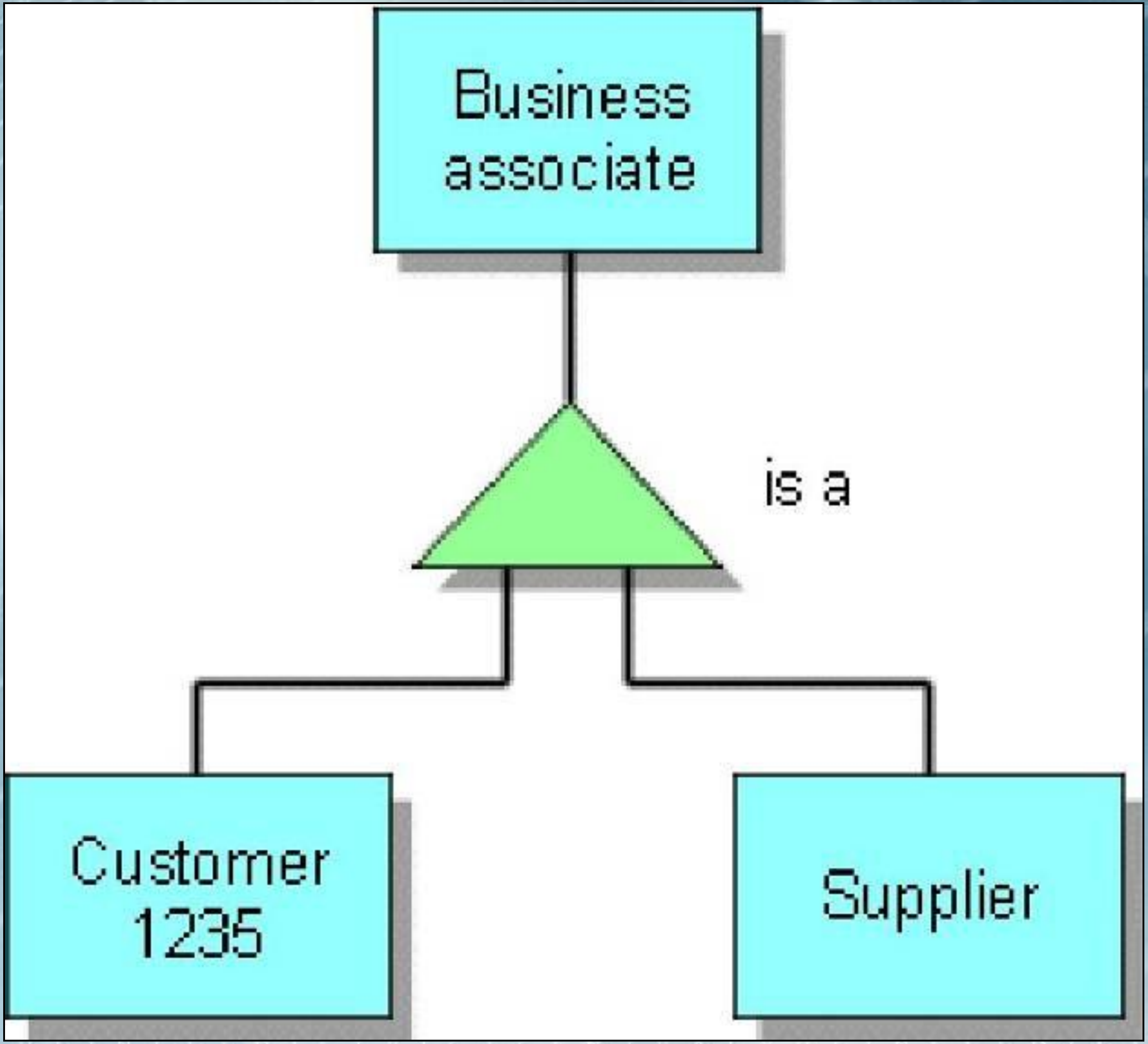
GENERALIZATION / SPECIALIZATION

Generalization means that similar object types are grouped under a superior object type.

Properties (described by attributes) that both source objects share are transferred to the generalized object type. Thus, only those attributes in which the source object types differ are left to be described. The formation of the new entity type is graphically represented by a triangle, also called an ”is a” relationship.

Specialization is the breakdown of a generic term into subterms. Specialization is the reverse of generalization. The specialized objects inherit the properties of the generalized object. Apart from these inherited attributes, the specialized object types may have their own attributes. Graphically, specialization and generalization are represented in the same way. For this reason, the links are not drawn as arrows indicating a direction.

GENERALIZATION / SPECIALIZATION

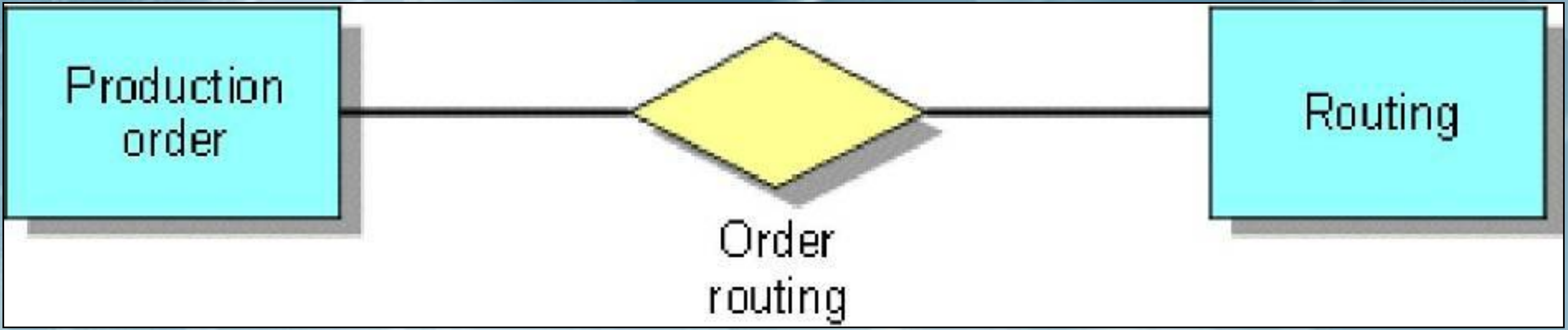


AGGREGATION

Aggregation is the formation of new object types by combining existing object types. The new object type can be carrier of new properties.

In the ERM, aggregation is expressed by the formation of relationship types.

The aggregation operator can also be applied to relationships. An existing relationship type is then treated as an entity type and can thus become the starting point for creating new relationships.



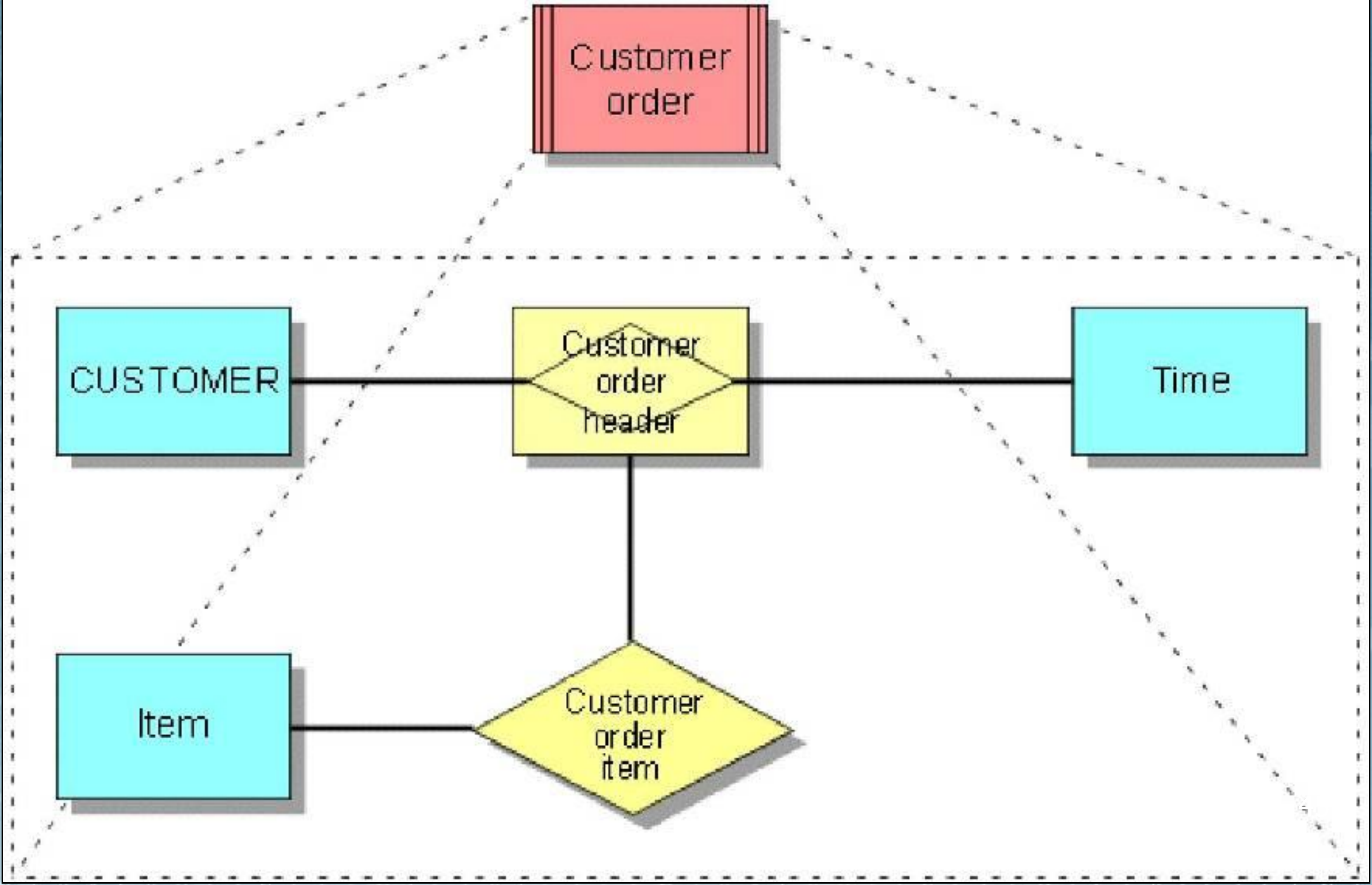
DATA CLUSTER

In an ERM, a complex structural context is split into a transparent structure. As the relation to the overall structure might become obscured, complex objects in the form of data clusters are introduced.

A data cluster is the logical view of multiple entity types and relationship types of a data model that are required for describing a complex object.

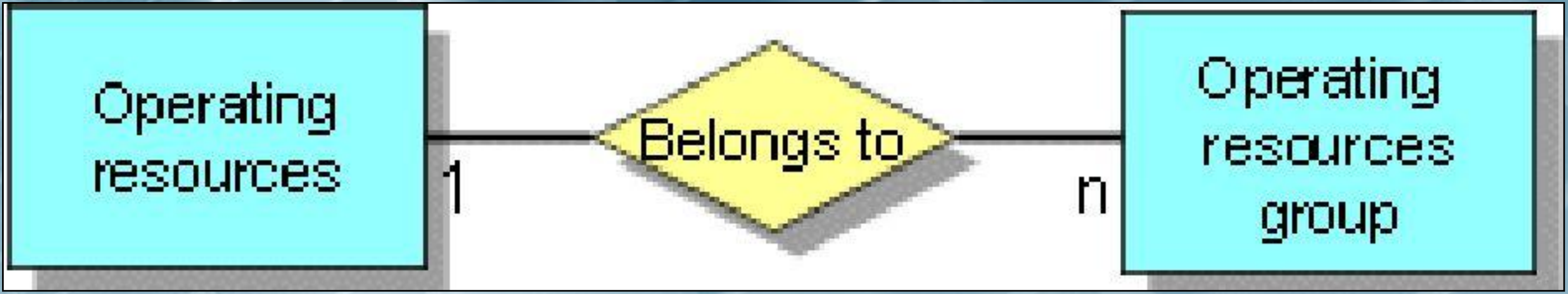
Besides entity types and relationship types, data clusters themselves can be part of a data cluster, too. Unlike entity and relationship types, data clusters can be arranged in any hierarchy and thus mainly support a top-down procedure in the process of creating data models. However, forming data clusters may also be very helpful when combining and consolidating submodels during a bottom-up approach.

DATA CLUSTER VIEW OF MULTIPLE OBJECTS



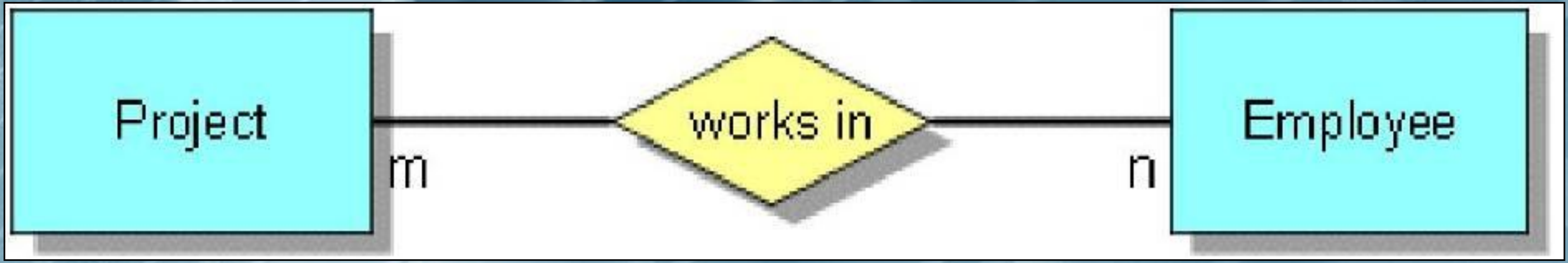
GROUPING

Grouping forms groups from the elements of an entity set. For example, all Operating resources are combined into an Operating resources group. The operating resources group is an independent object which can be described more precisely by additional attributes (name of the operating resources group, number of operating resources) not contained in the individual operating resources.



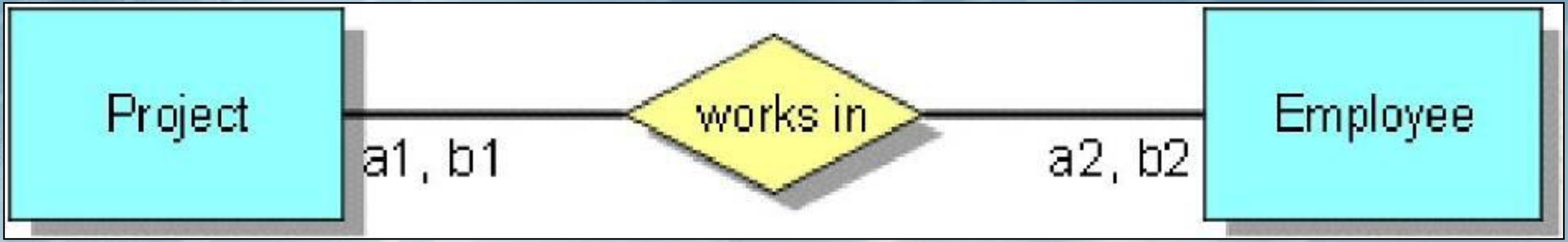
EXTENSION OF CARDINALITIES

When specifying cardinalities, so far only the upper limit for the admitted number of relationship occurrences was indicated. For example, the cardinalities indicate that a project can be assigned a maximum number (m) of employees and one employee can participate in a maximum number (n) of projects.



EXTENSION OF CARDINALITIES

The upper limit, the lower limit specifying the minimum number of relationship occurrences may also be of interest.
For this purpose, the cardinalities can be expressed as a letter pair (*a*, *b*). The letter pair (*a1*, *b1*) in the following figure indicates that every project can participate in at least *a1* and at most *b1* relationship occurrences of the works in type, which means that every project can be assigned at least *a1* and at most b1 employees. The other letter pair (*a2*, *b2*) indicates that one employee can participate in at least *a2* and in at most *b2* projects.

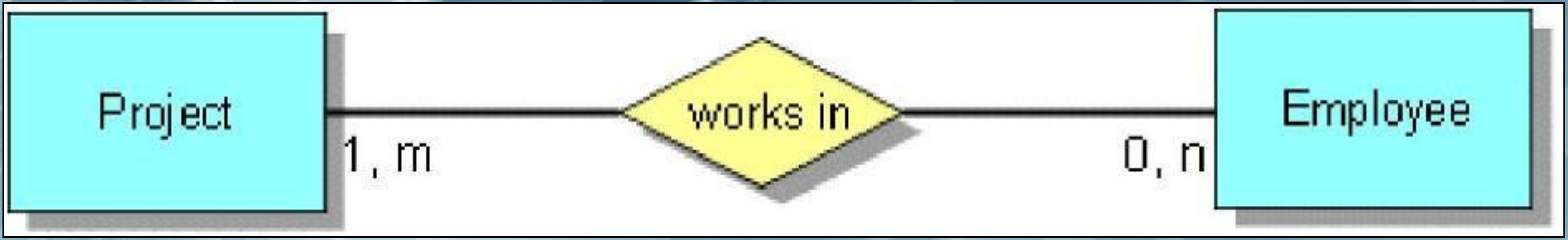


EXTENSION OF CARDINALITIES

Every relationship is defined by two degrees of complexity (minimum, maximum). The lower limit often has the values 0 and 1, whereas the value range for the upper limit is defined as
1 <= max <= * (where * is “any number”).
A lower limit of min = 0 means that an entity may participate in a relationship, but does not necessarily have to.
A lower limit of min = 1 indicates that an entity must participate in at least one relationship.

EXTENSION OF CARDINALITIES

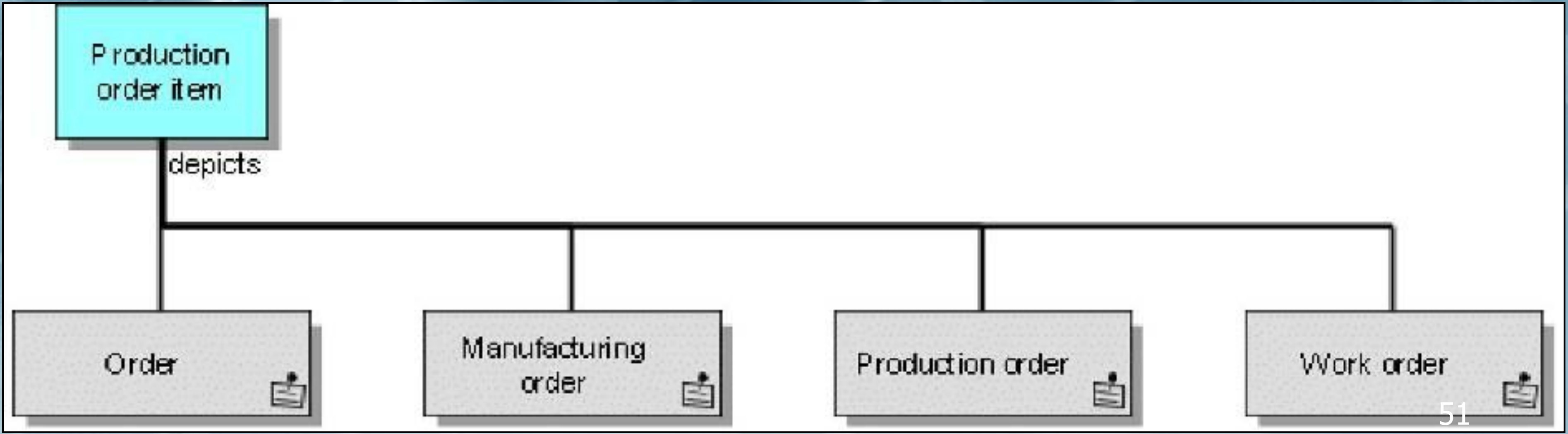
In the example, the lower limits indicate that an employee may participate in a relationship, but does not necessarily have to (min = 0), while a project has to participate in at least one relationship (min = 1). What is expressed here is that there can be employees who are not assigned to a project. In turn, however, every project must be assigned at least one employee.



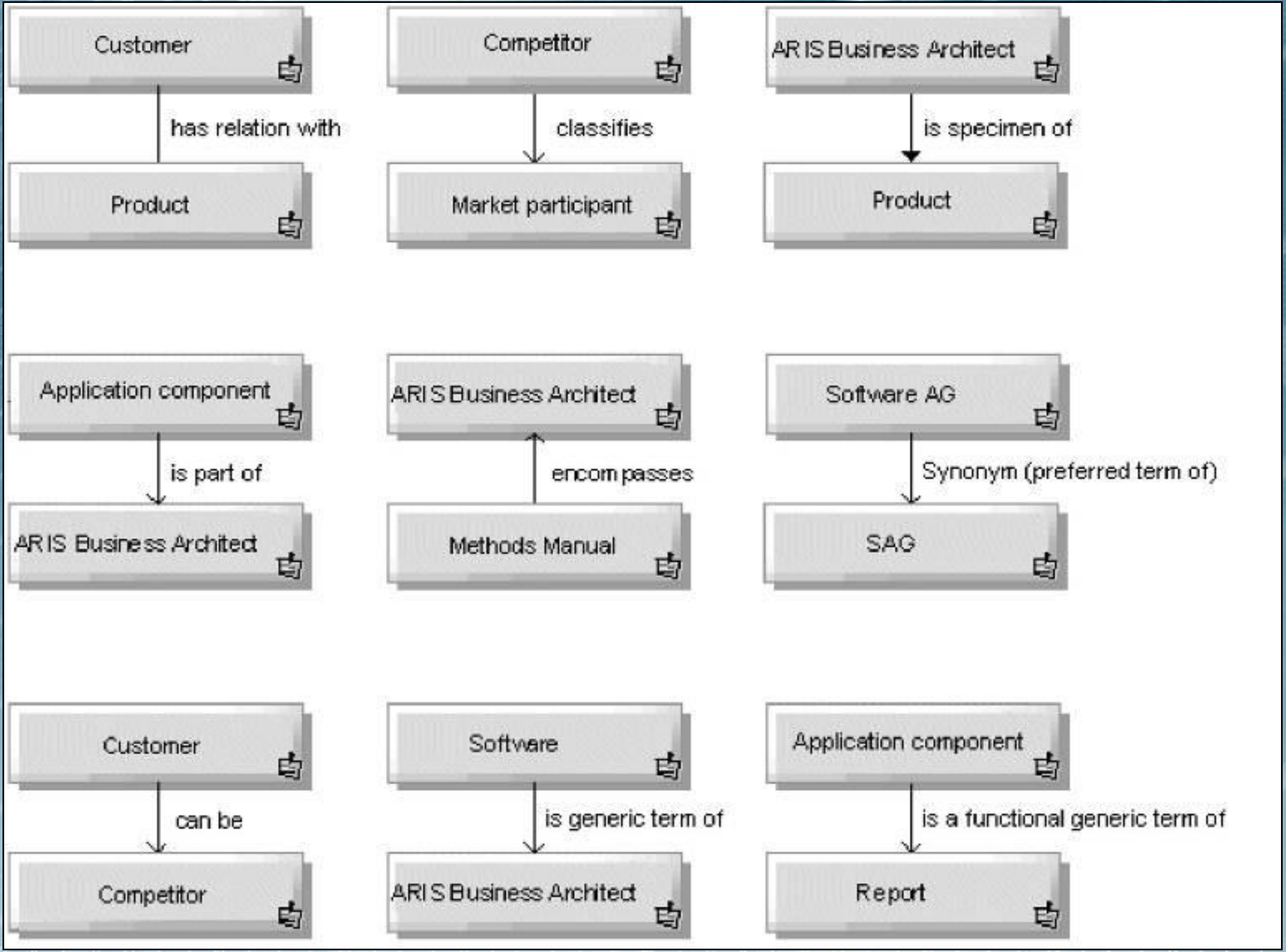
TECHNICAL TERMS MODEL

Technical terms model can be used to manage the various terms in the form of synonym management for data objects, or to specify the relationships that exist between the objects of data models (entity type, relationship type, etc.) and the technical terms used within the company.

Technical terms can be interrelated and may be arranged in a hierarchy.

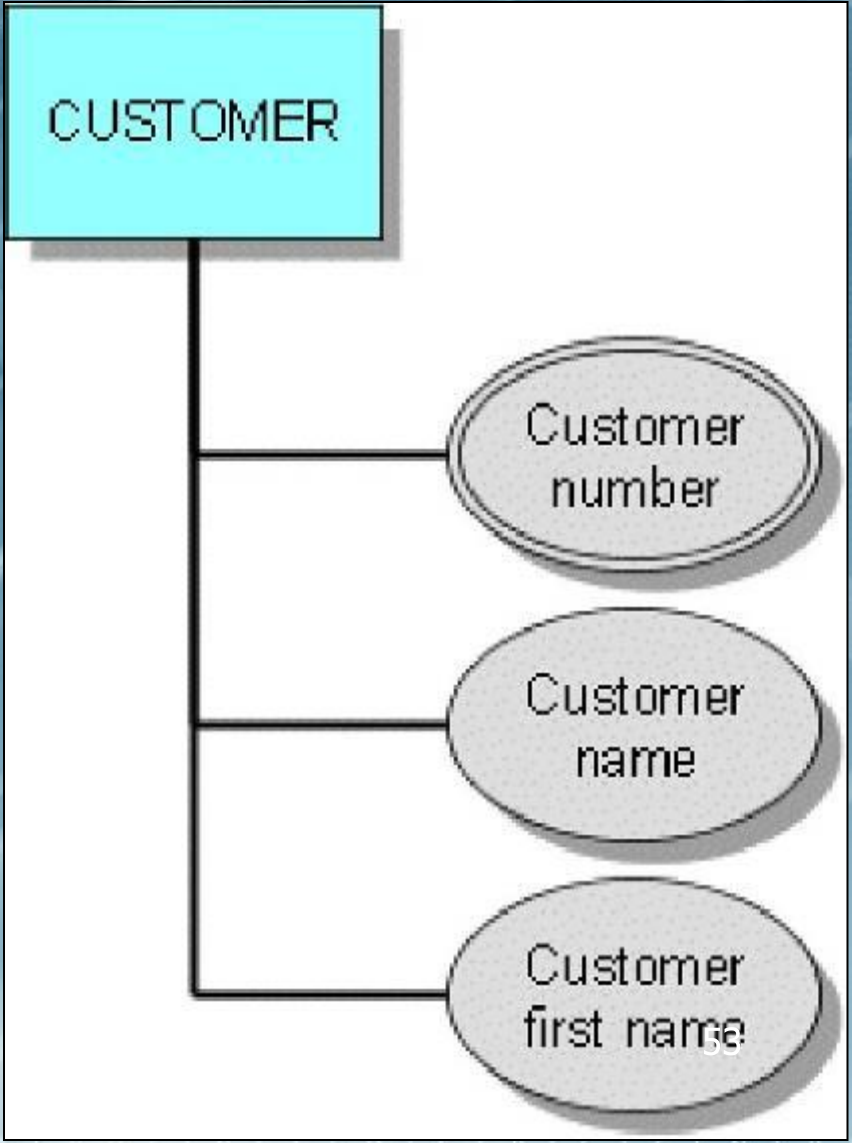


TECHNICAL TERMS MODEL



eERM ATTRIBUTE ALLOCATION DIAGRAM

eERM attribute allocation diagrams enable to assign ERM attribute allocations to every entity type and relationship type in a separate model. The object type of the eERM (entity type or relationship type) can be included in this model as an occurrence copy, and the relationships to the ERM attributes can be modeled. It is possible to distinguish whether the linked ERM attribute is a key attribute, a foreign key, or a descriptive attribute.

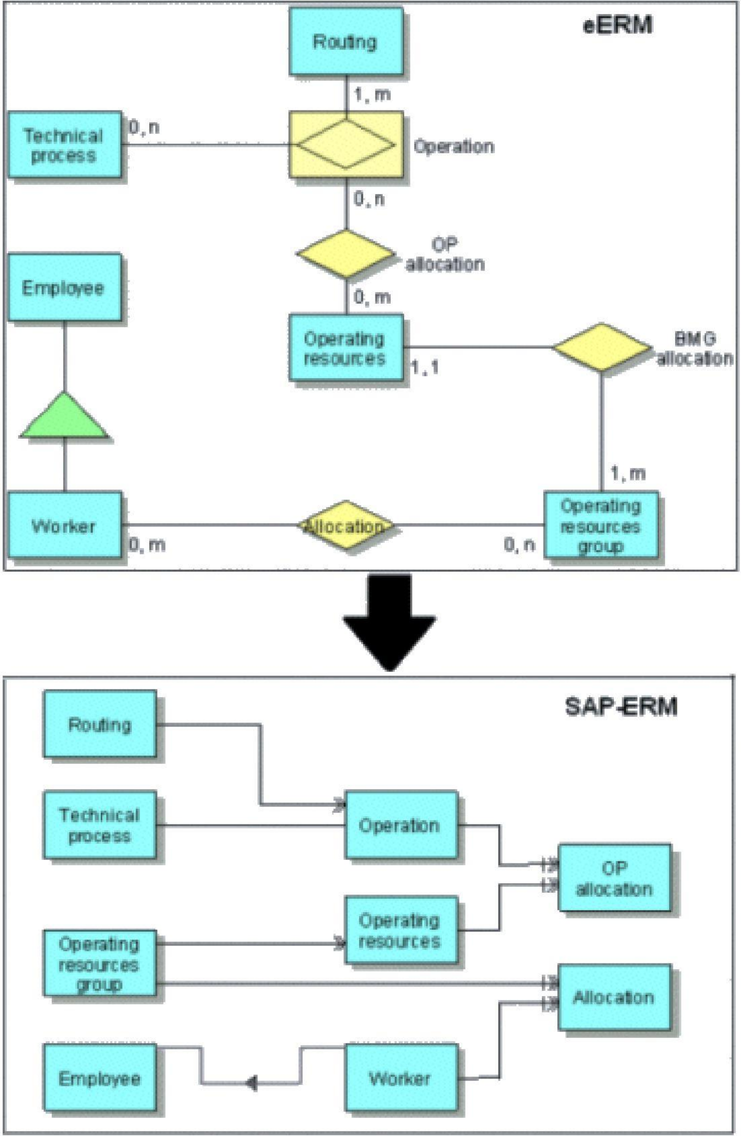


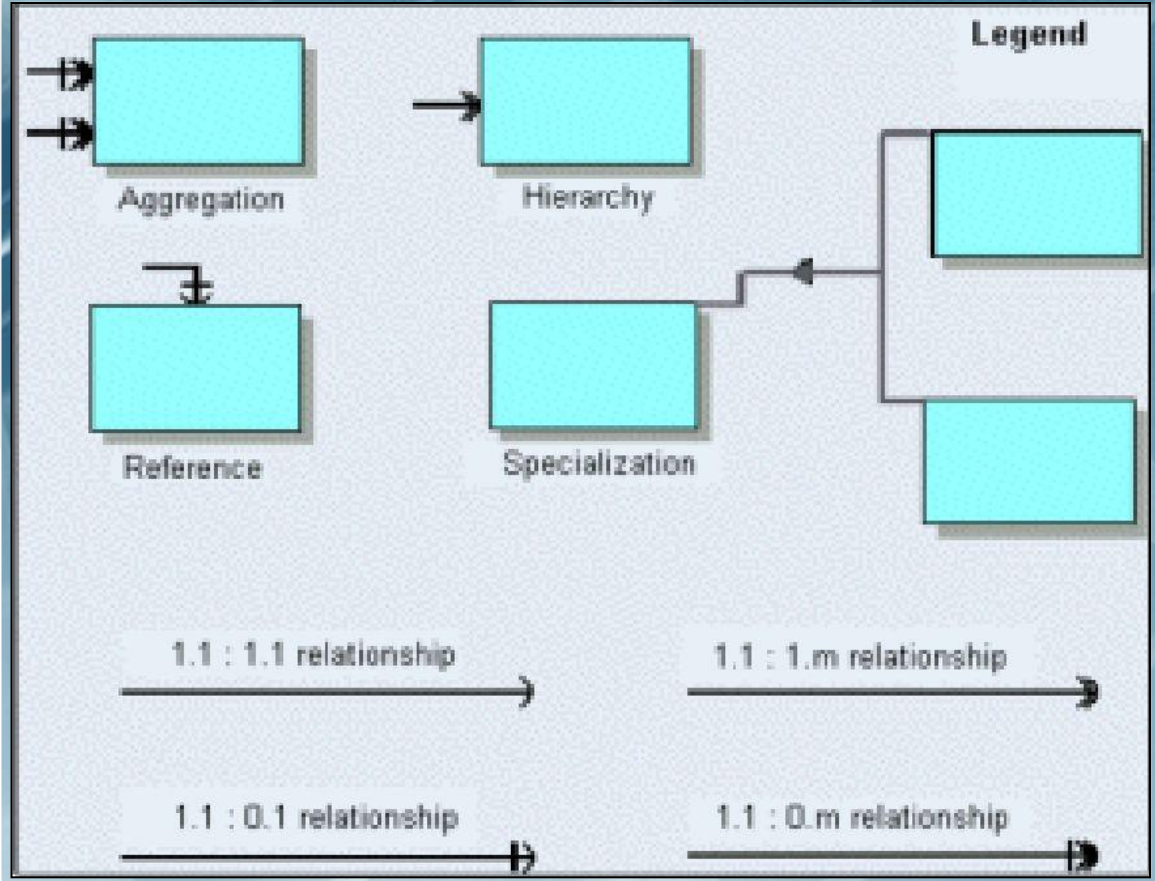
SAP SERM

The modeling technique developed by SAP AG. In this context, no graphic distinction is made between entity types and relationship types during object formation. The dependencies between information objects are expressed by the relationship complexity of the arrow representations. A distinction is made between hierarchical, aggregating, and referential relationships:

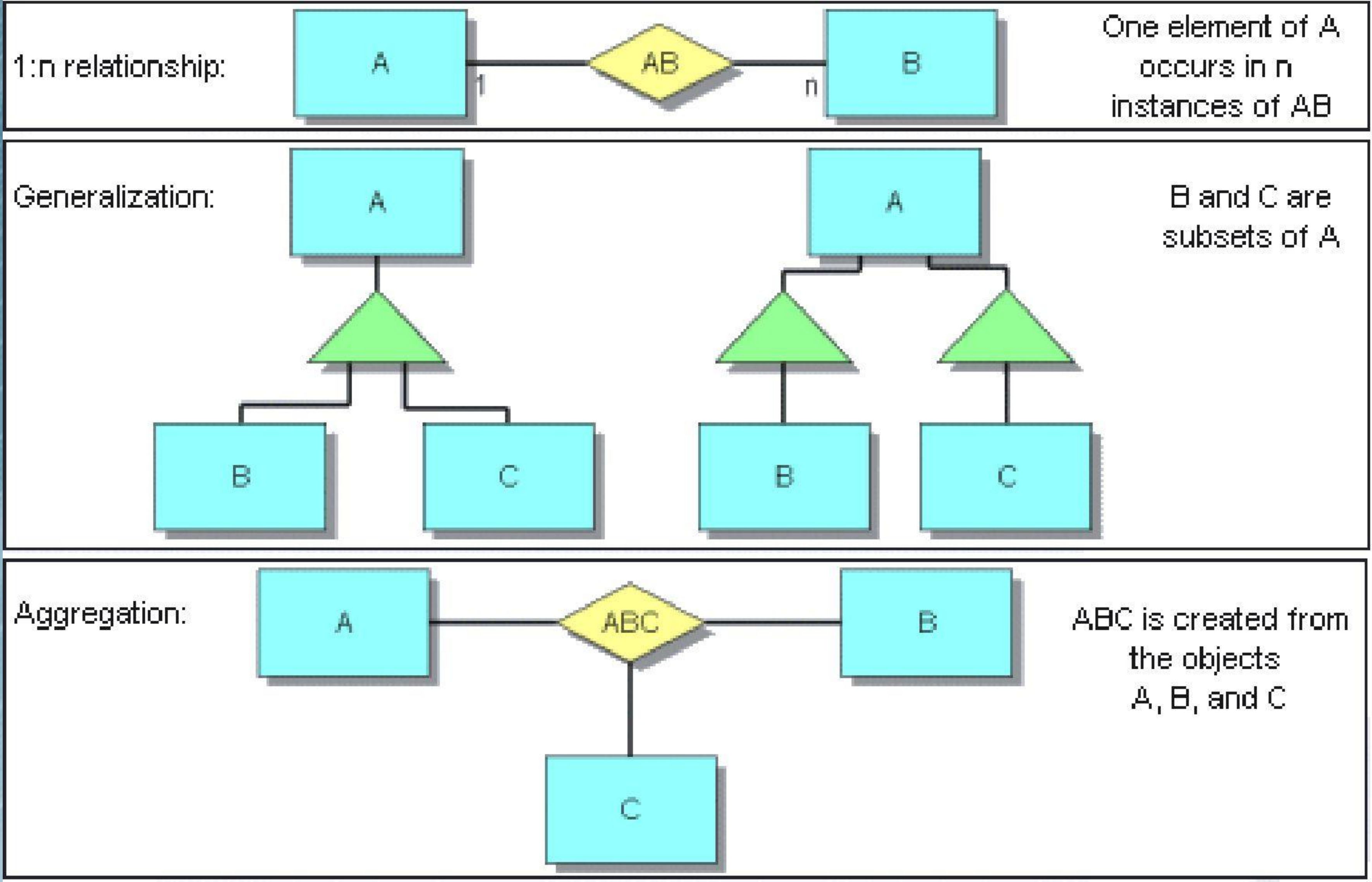
- Hierarchical relationships define a unilateral existence dependency between information objects. Aggregating relationships correspond to the formation of relationship types based on the eERM approach.
- Referential relationships describe logical dependencies between reinterpreted entity types and original entity types based on the eERM approach.
- Specialization is represented in analogy to the ERM approach.

eERM and SAP SERM REPRESENTATION





eERM: TERMS AND FORMS REPRESENTATION



1:n relationship:

One element of A occurs in n instances of AB

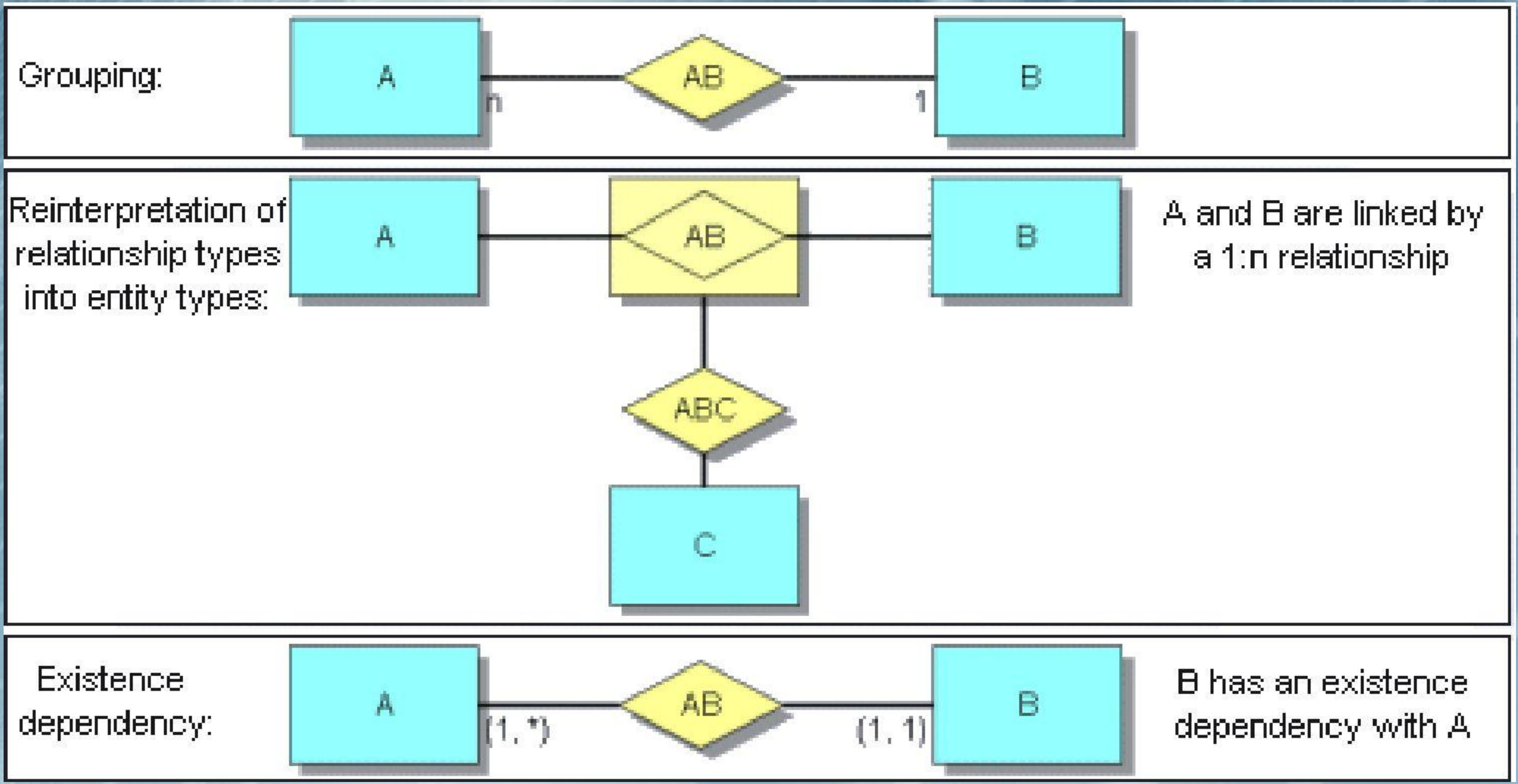
Generalization:

B and C are subsets of A

Aggregation:

ABC is created from the objects A, B, and C

eERM: TERMS AND FORMS REPRESENTATION



Grouping:

Reinterpretation of relationship types into entity types:

A and B are linked by a 1:n relationship

Existence dependency:

B has an existence dependency with A

DOCUMENT TYPE DEFINITION

A model of the DTD (Document Type Definition) type describes the rules according to which an XML document of a specific type must be structured. The description is provided in the form of element type declarations.

A DTD can be used to define the general structure of a document type. A valid document of a document type defined in the DTD can be created as an XML document. This has the advantage that the document can be processed by various programs based on the corresponding DTD.

MATERIAL FLOW MODELING – MATERIAL DIAGRAM

To illustrate the material flow in process models material types are allocated to individual functions of the business process in the form of function input or output.

In the material diagram, can be defined material types, arranged them in a hierarchy, and assigned them to material classes.

A material type typifies individual materials with identical material properties.

Similar material types can be combined to form a material class. The similarity can be based on different classification criteria. Thus, a material type can be assigned to multiple material classes. Material types can be assigned to packaging material types. This indicates that certain material types can only be transported in specific packaging material types.

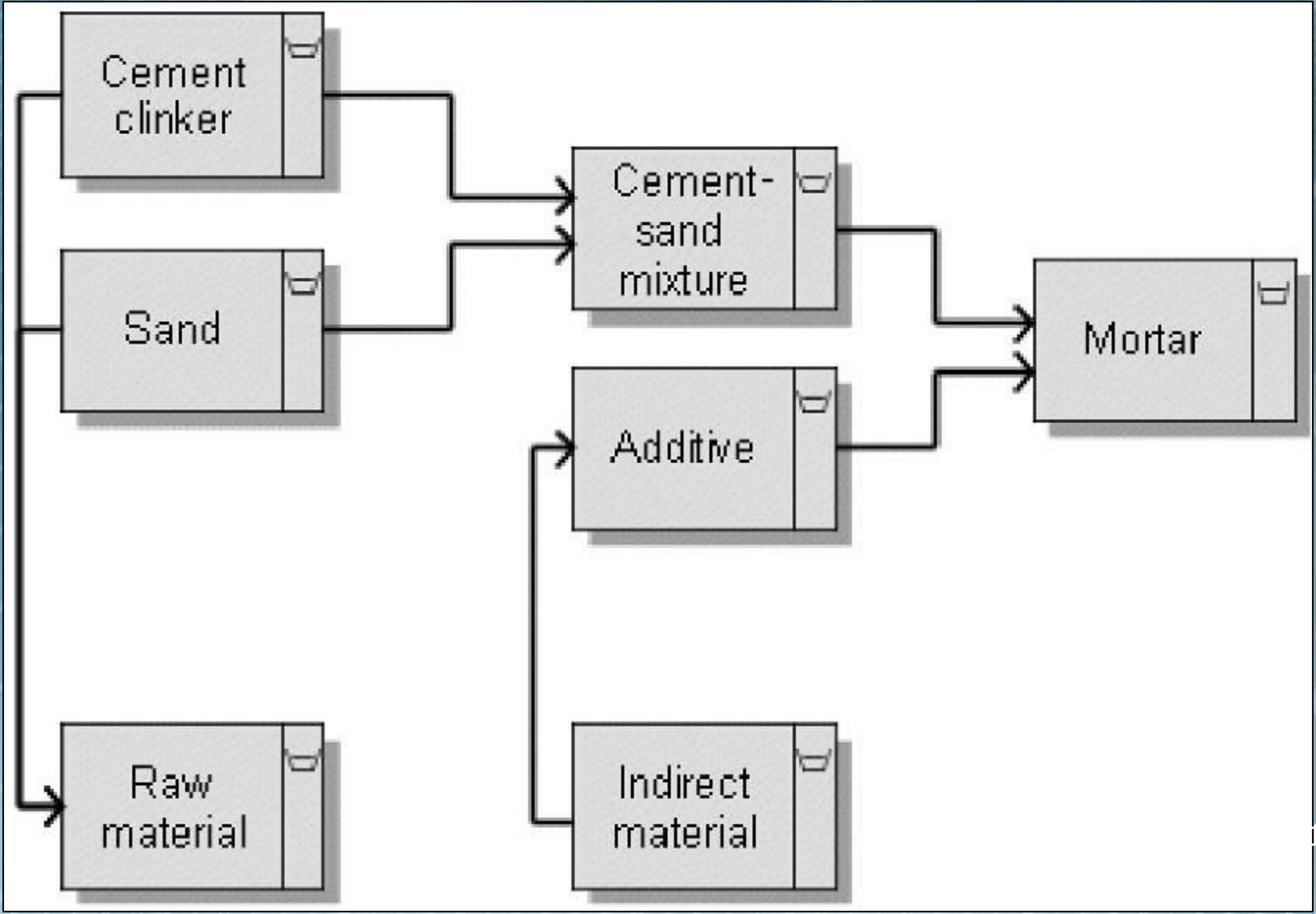
MATERIAL FLOW MODELING – MATERIAL DIAGRAM

Packaging material types can also be arranged in hierarchies and classified. This enables the structure and restrictions of complex bulk packaging to be illustrated.

A packaging material type typifies individual packaging materials with identical properties (e. g., material properties).

Similar packaging material types can be combined to form a packaging material class. The similarity can be based on different classification criteria. Thus, a packaging material type can be assigned to multiple packaging material classes.

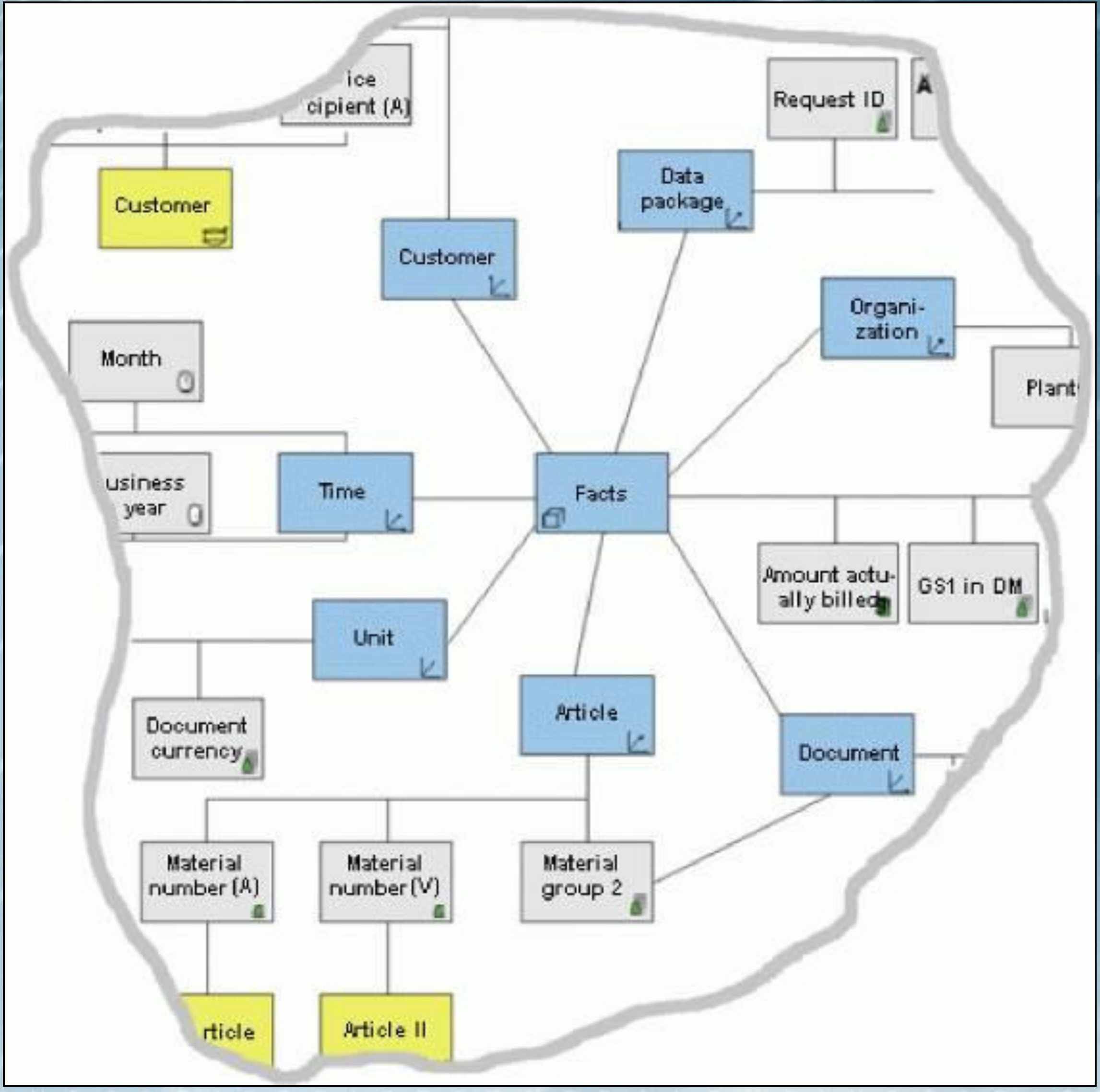
EXAMPLE OF A MATERIAL DIAGRAM



MODELING THE DATA WAREHOUSE STRUCTURE

The Data Warehouse structure diagram describes the structure of a Data Warehouse. Primarily, the diagram is a static description, i.e., it illustrates the interrelation of data as well as their locations. In the ARIS architecture this type of description is realized in the data view. The focus lies on the interrelation and arrangement of information. The data dimensions are described by the info cube. The interplay of the dimensions is represented by the star schema (see the following figure). A dimension can serve as a key for connecting other dimensions. The objects of individual dimensions can have specific values, which are cataloged in fact tables and are exactly defined by KPIs. Dependencies are described in dimension tables listing their key attributes and characteristics. The hierarchical interrelations of the features are described by tree structures. Finally, dimensions can be allocated to master data tables using the structure diagram.

DATA WAREHOUSE IN THE STAR SCHEMA

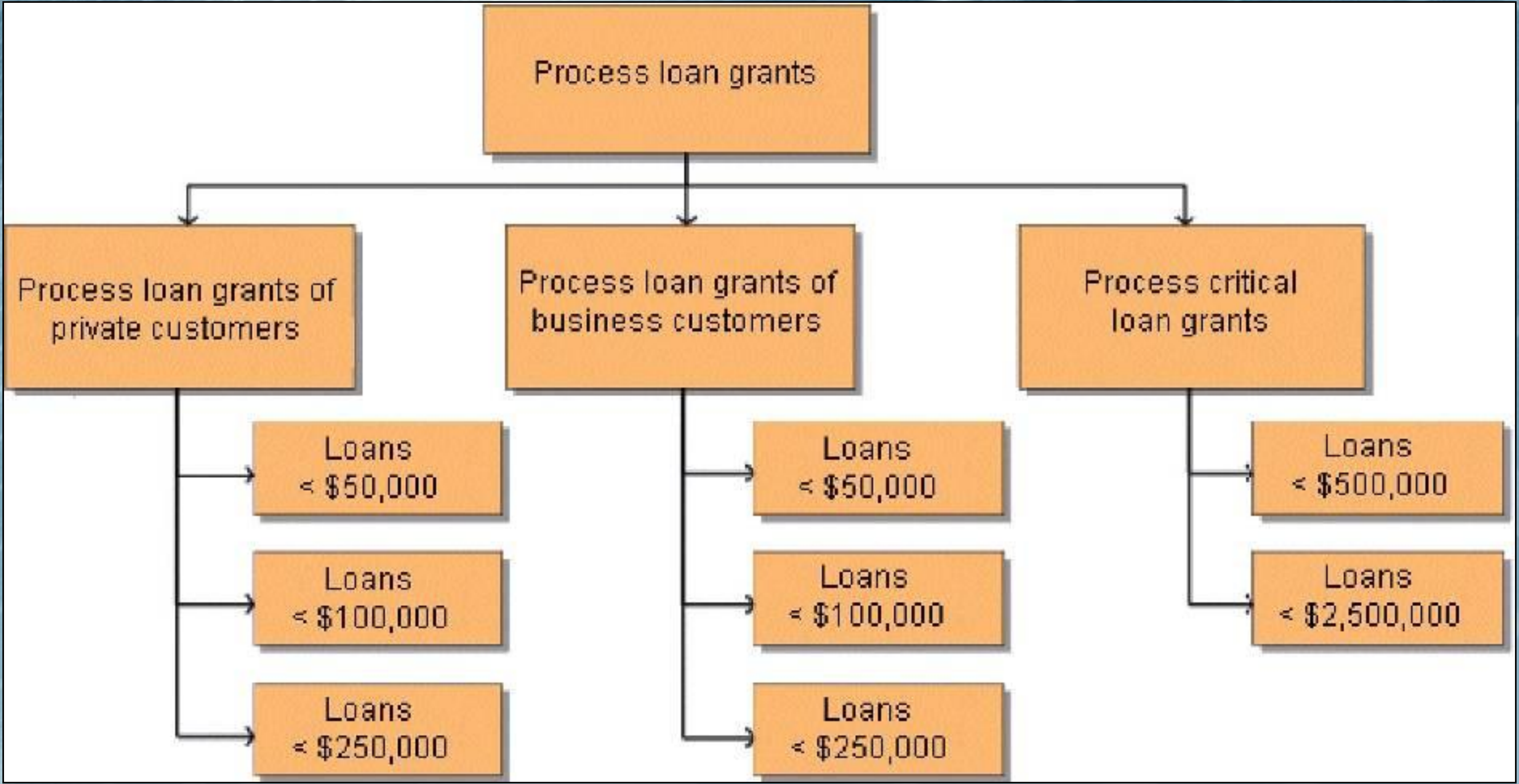


AUTHORIZATION HIERARCHY

The authorization hierarchy diagram is used in role modeling and organizational modeling. It illustrates the relationships of authorizations that were defined in the role diagram. Superior and subordinate authorizations are defined to ensure a logical structure and avoid authorization conflicts.

The authorization hierarchy diagram is closely associated with the role diagram. The authorizations listed are used in the role description to define the requirements profile. The structure corresponds to that of a function tree.

AUTHORIZATION HIERARCHY



COST DRIVER DIAGRAM

The CD diagram (cost driver diagram) is used in process cost management (e. g., with ARIS Business Optimizer).

The CD diagram represents the cost driver hierarchy.

A cost driver is an informative indicator or reference value for estimating the costs of a specific process. The reference value should be an operational value that can be easily derived from available information sources and is proportional to accruing costs.

COST DRIVER DIAGRAM

Cost drivers can be defined only for performance amount-variable or performance amount-induced processes.

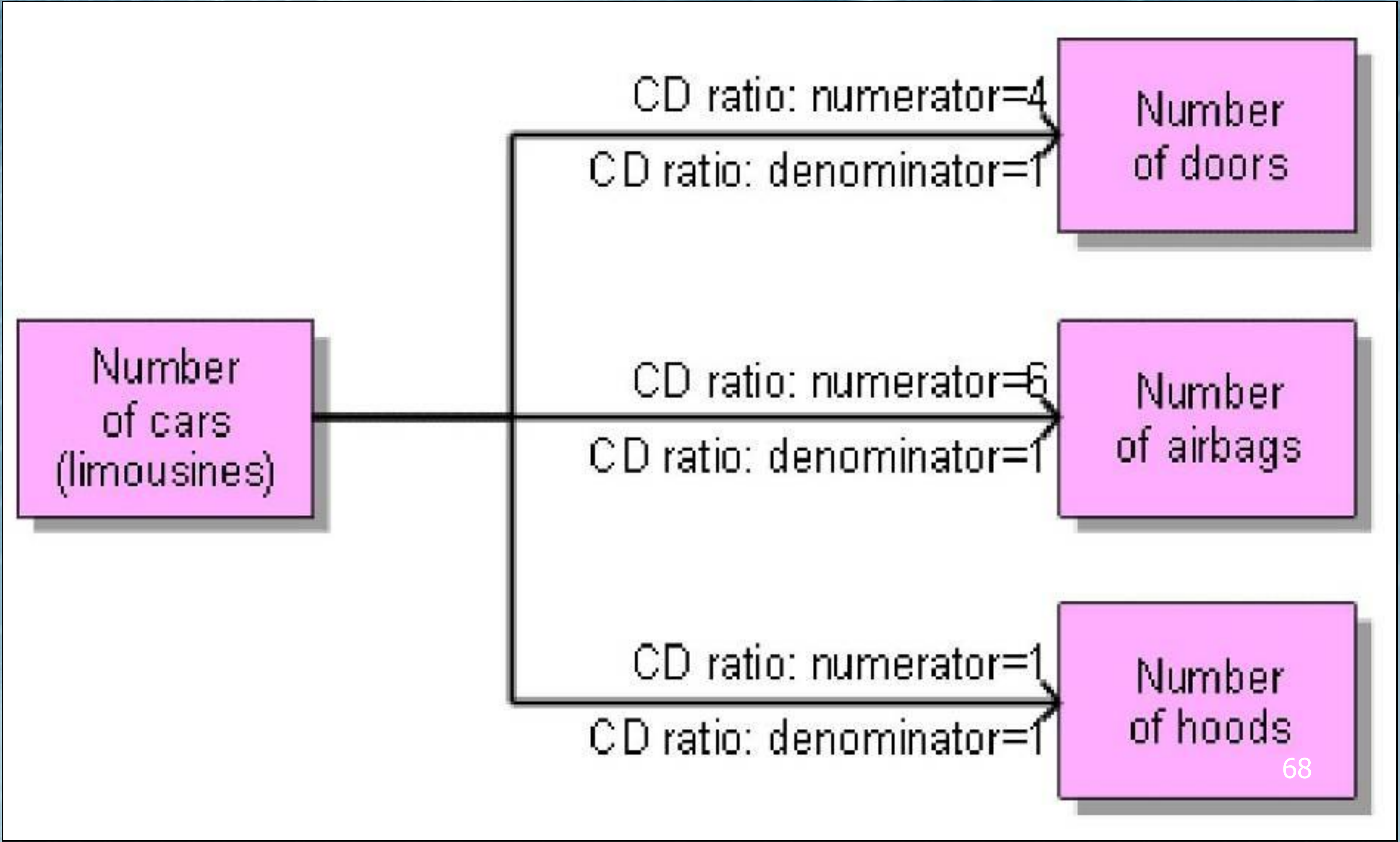
The hierarchy of cost drivers is represented in the CD diagram by directed connections of the determines volume of type.

The CD ratio numerator and CD ratio denominator attributes must be specified for these connections.

If CD ratio denominator is not specified, a value of 1 is assumed.

The quotient of these two attributes determines the quantity ratio between the two cost drivers for process calculation.

COST DRIVER DIAGRAM



COST CATEGORY DIAGRAM

The cost category diagram is used in process cost management, e.g., with ARIS Business Optimizer. They illustrate the hierarchy of cost categories.

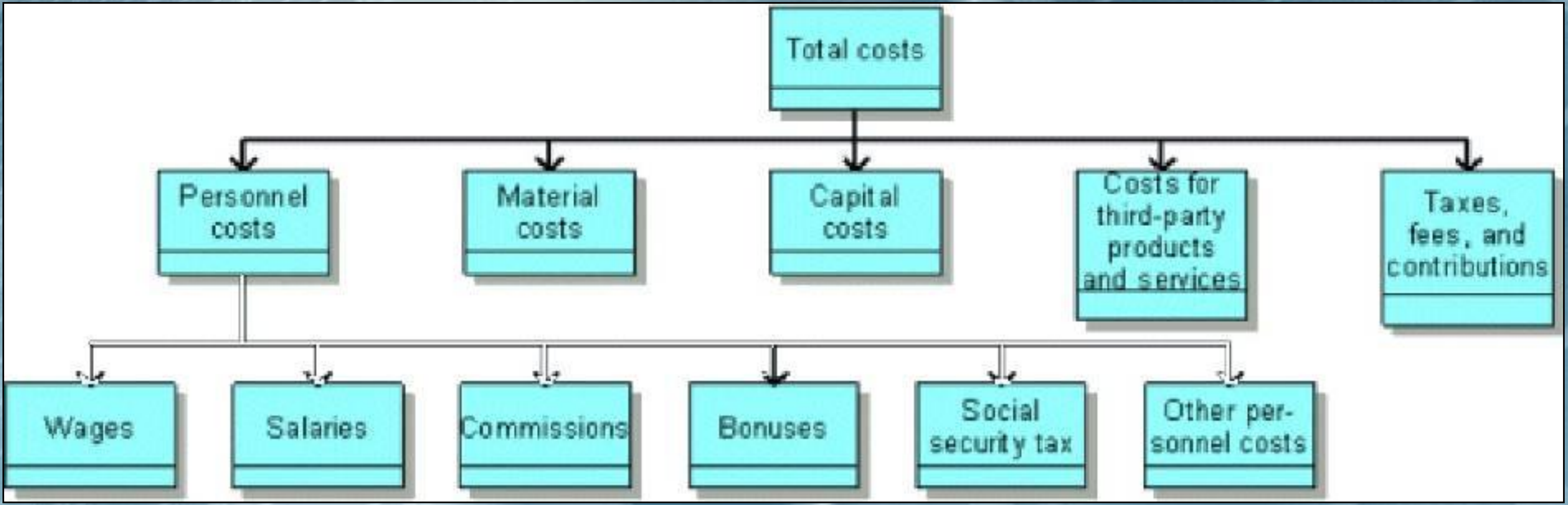
Cost categories serve to systematically structure all costs that arise from the creation and utilization of cost objects.

The question is: *What costs have been incurred?*

The hierarchy of cost categories is illustrated in the cost category diagram by directed connections of the **is superior** type.

An important attribute for cost categories is **performance scale**. It describes the unit in which cost category performance is measured (e.g., hours for wages and square meters for occupancy costs).

COST CATEGORY DIAGRAM



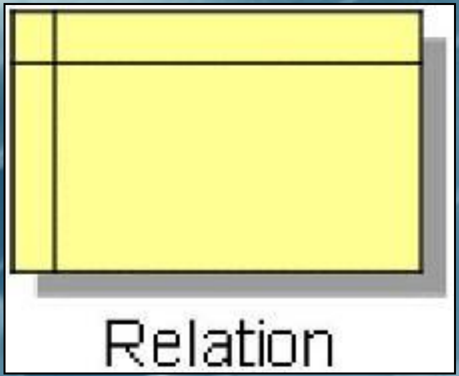
RELATIONS DIAGRAM

In the design specification, the logical data structures designed in the requirements definition are transformed into a form of description that concrete database systems can be based on. ARIS provides the relations diagram for this purpose.

The relations diagram and the attribute allocation diagram are available to define existing relations and attributes including their relationships to the information objects introduced in the requirements definition.

RELATIONS DIAGRAM

In a first step, the required relations are defined in the relations diagram.



A relation describes an entity type through its attributes. A relation is a subset of possible value range combinations of individual attributes.

Every eERM entity type now constitutes a relation in the relations diagram. When realizing relationship types of an eERM, the cardinality is a very important factor in deciding whether or not to create a separate relation for the relationship type.

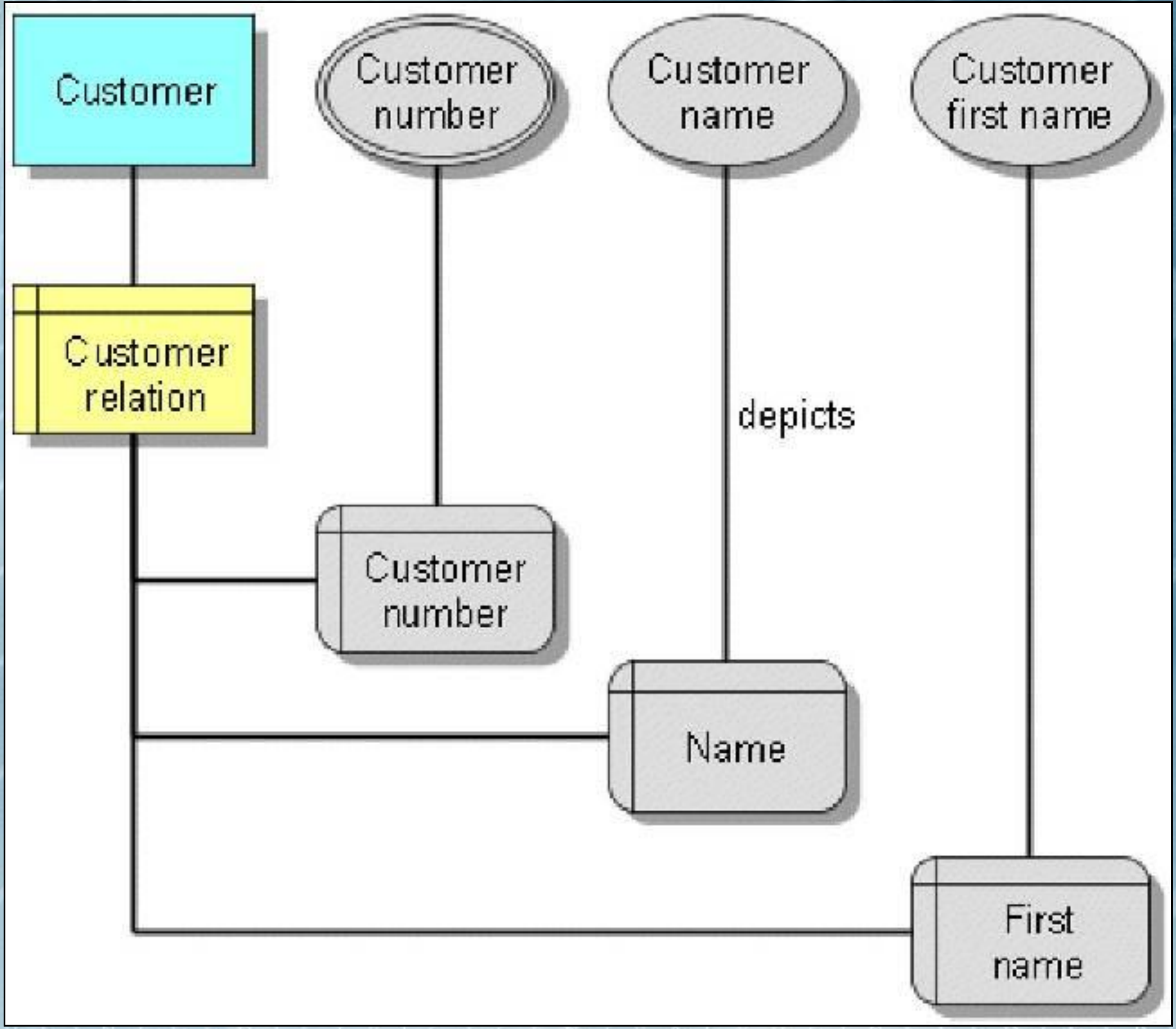
Unlike 1:n relations, n:m relations must be represented in separate relations.

RELATIONS DIAGRAM

In a second step, the relations diagram can indicate for each relation which entity type or relationship type of the eERM it represents.

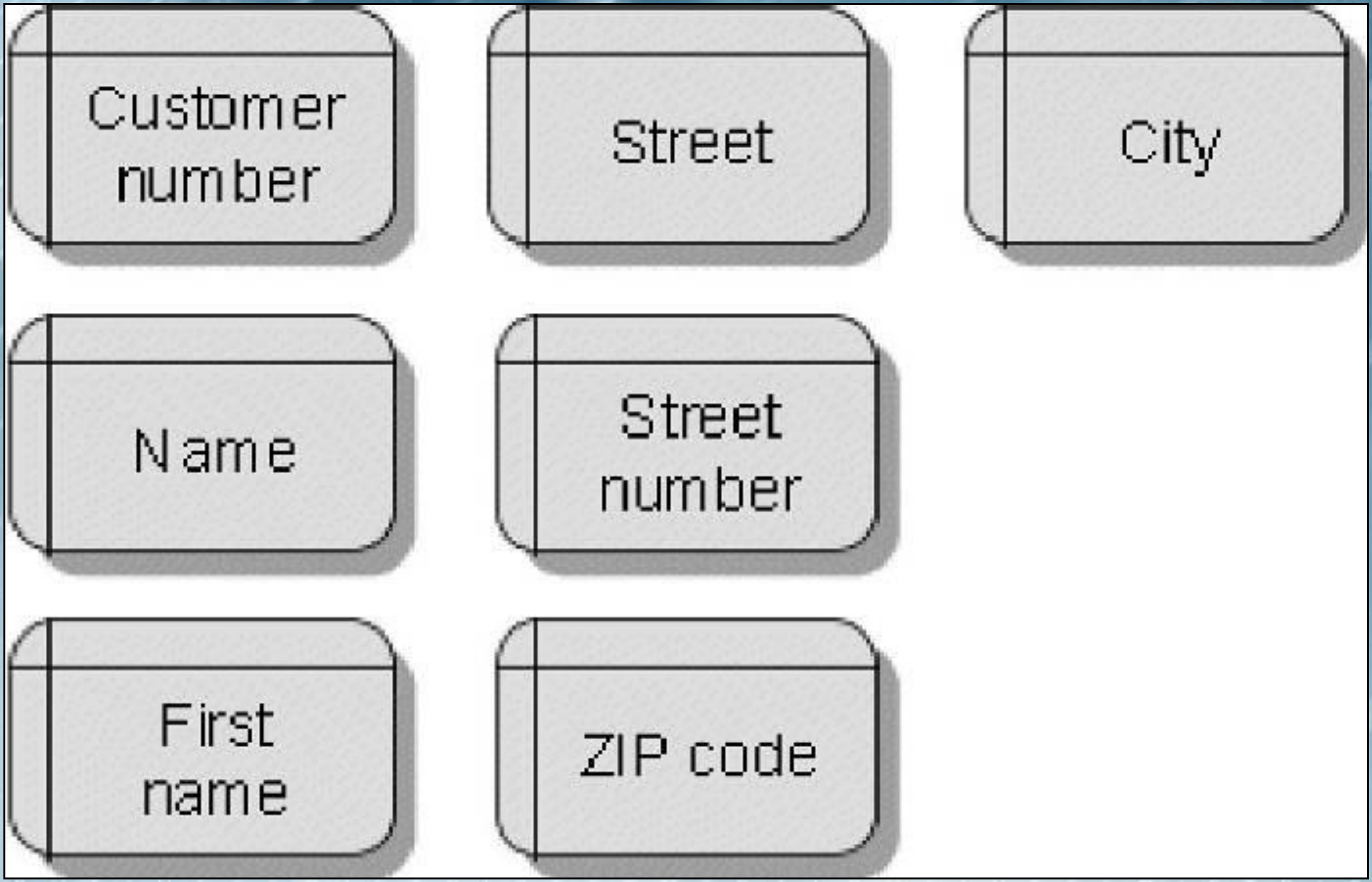
A relation can be specified in more detail by listing its attributes. Whether the corresponding attribute serves as a key attribute, foreign key attribute, or descriptive attribute may be defined by specifying the relevant connection when linking the relation and the attribute. Also, the relationship of every single attribute to the ERM attribute of the requirements definition it illustrates can be established.

ALLOCATION OF THE REQUIREMENTS DEFINITION ATTRIBUTES AND DATA OBJECTS



ATTRIBUTE ALLOCATION DIAGRAM

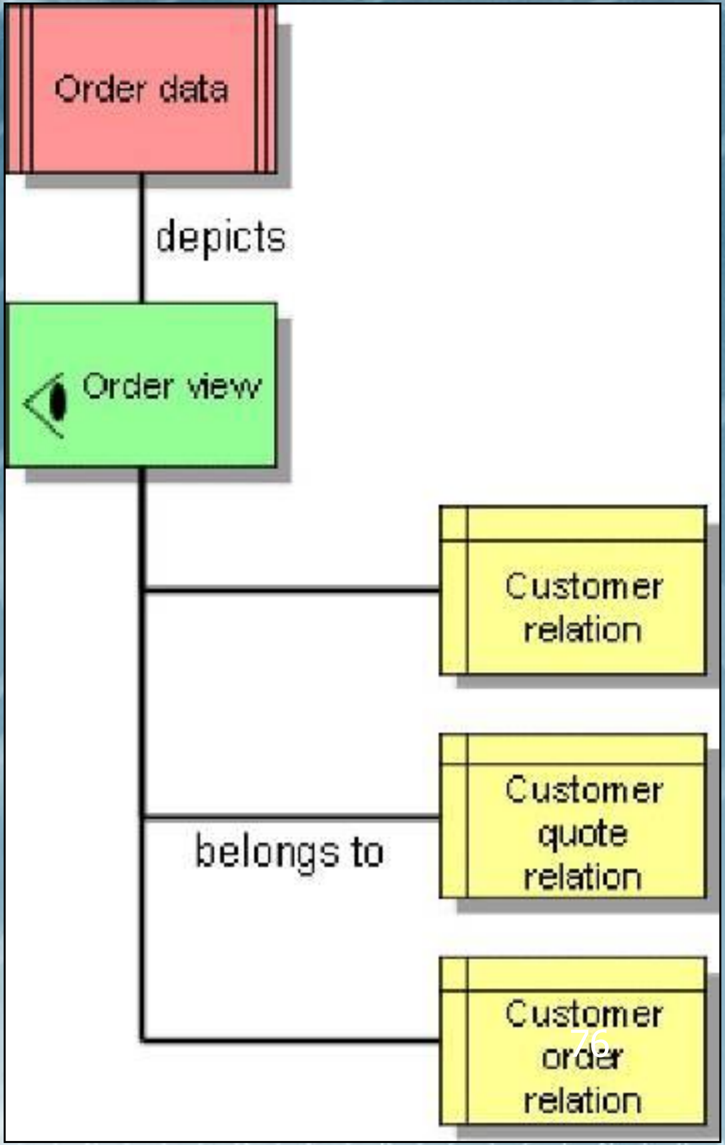
To reduce representation complexity, the attributes of every relation can be defined in an attribute allocation diagram that is linked to the relation.



LOGICAL VIEW OF MULTIPLE RELATIONS

The data clusters of the requirements definition are realized in the design specification by a separate object type called “View”.

Based on the definition of data clusters, “View” is defined as: A “View” is the logical view of multiple relations.



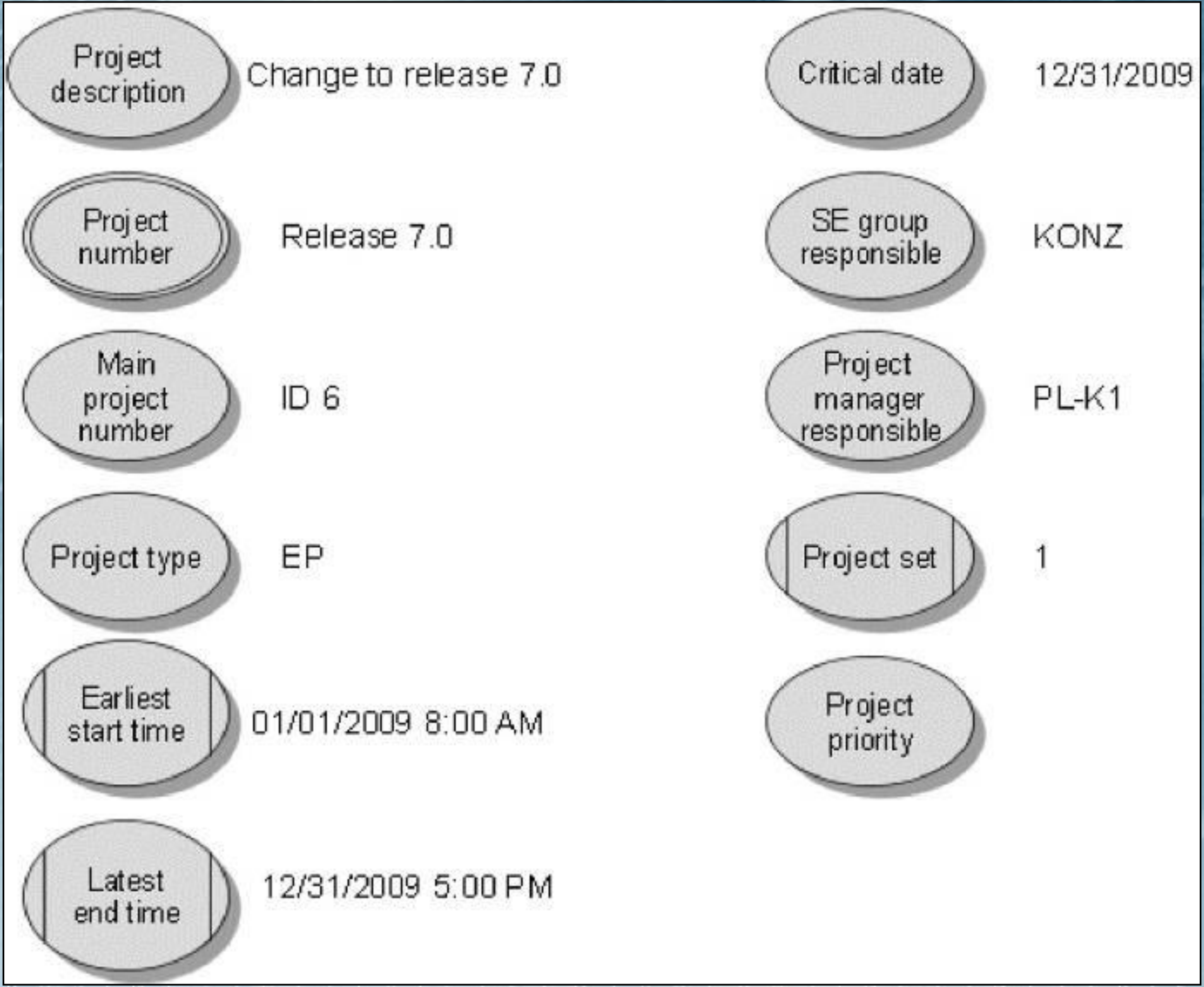
SYSTEM ATTRIBUTES MODEL

The System attributes model type is primarily designed to perform data export-oriented tasks in ARIS Business Architect. This model type enables you to arrange entity types, events, technical terms, functions, information carriers, organizational units, and persons in a hierarchy, and specify them uniquely and comprehensively according to their data processing requirements. This data can be typified based on the usual database requirements as primary and foreign keys, as well as descriptive and mandatory fields.

To determine the domain types of these data objects, you can assign the System attribute domain model type.

In contrast to ERM attributes, the main feature of system attributes is the representation and management of interface-oriented data. To ensure high flexibility in terms of the contents to be exported, the system attribute objects contain two value fields that can be filled with relevant information.

EXAMPLE OF A "SYSTEM ATTRIBUTES" MODEL



Project description	Change to release 7.0	Critical date	12/31/2009
Project number	Release 7.0	SE group responsible	KONZ
Main project number	ID 6	Project manager responsible	PL-K1
Project type	EP	Project set	1
Earliest start time	01/01/2009 8:00 AM	Project priority	
Latest end time	12/31/2009 5:00 PM		

SYSTEM ATTRIBUTE DOMAIN

The System attribute domain model type is used to define the system attribute objects based on the data type; it specifies the domain type (char, int, date, etc.) and field length, for example. It is mainly used to provide information when data is exported to external systems.

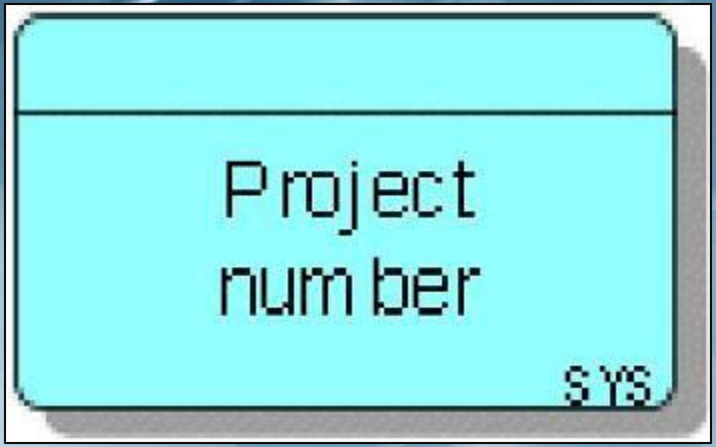
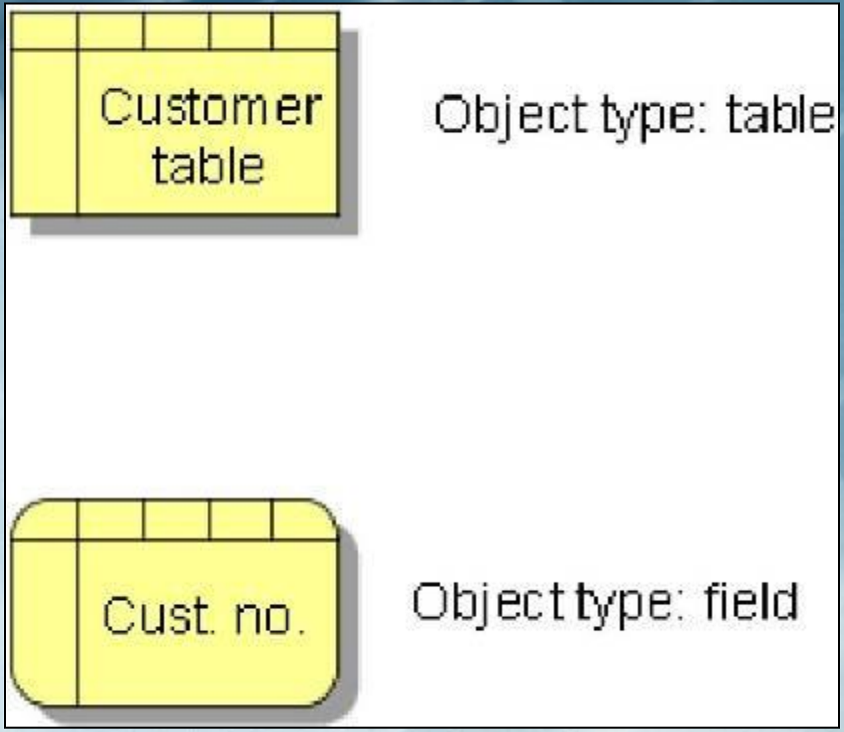


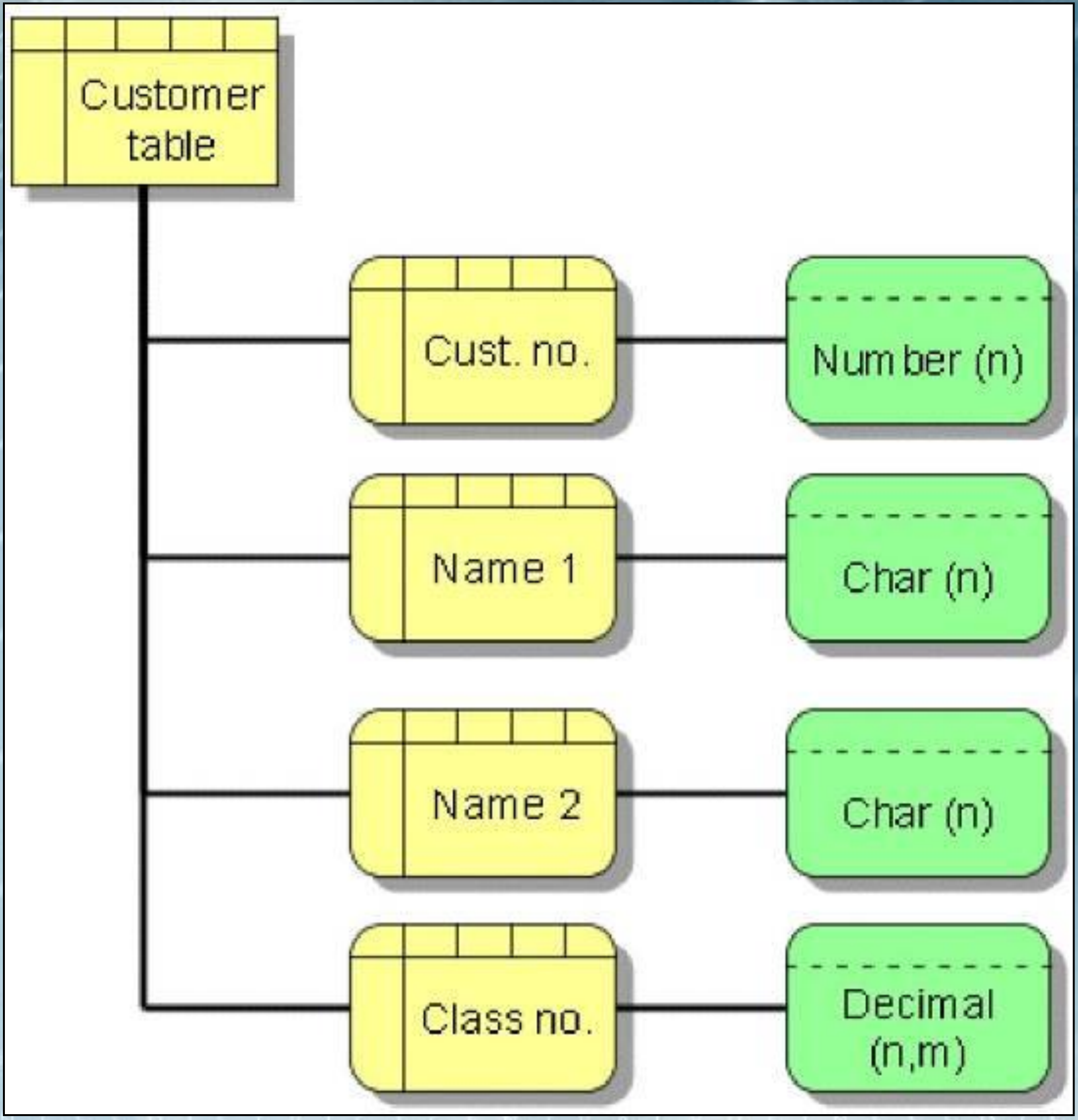
TABLE DIAGRAM

The table diagram is used to describe the tables and fields of a database system.

The individual fields assigned to this table can be shown for each table. For further specification, a sorting index and the domain can be assigned to each field.



FIELD ALLOCATIONS



ALLOCATION OF REQUIREMENTS DEFINITION AND DESIGN SPECIFICATION OBJECTS

As relations of a relations diagram are not necessarily converted into tables and fields on a 1:1 basis (e. g., for reasons of database performance), multilateral relationships between tables and relations or entity types may occur. These relationships can be illustrated in the table diagram by selecting the relevant connections. The data clusters defined in the requirements definition or the views defined in the relations diagram are represented in the table diagram by the View (physical) object.

ALLOCATION OF REQUIREMENTS DEFINITION AND DESIGN SPECIFICATION OBJECTS

Due to the fact that converting or documenting database tables and fields used in a company does not necessarily require the definition of a relational schema, both the realization relationships between relations (or attributes) and tables (or fields) and between entity types (or ERM attributes) and tables (or fields) can be represented.

The representation may focus either on the relations and attributes realized by the tables and fields, or – leaving out the relational definitions – on the entity types, relationship types, and ERM attributes illustrated by the tables and fields.

ALLOCATION OF REQUIREMENTS DEFINITION AND DESIGN SPECIFICATION OBJECTS

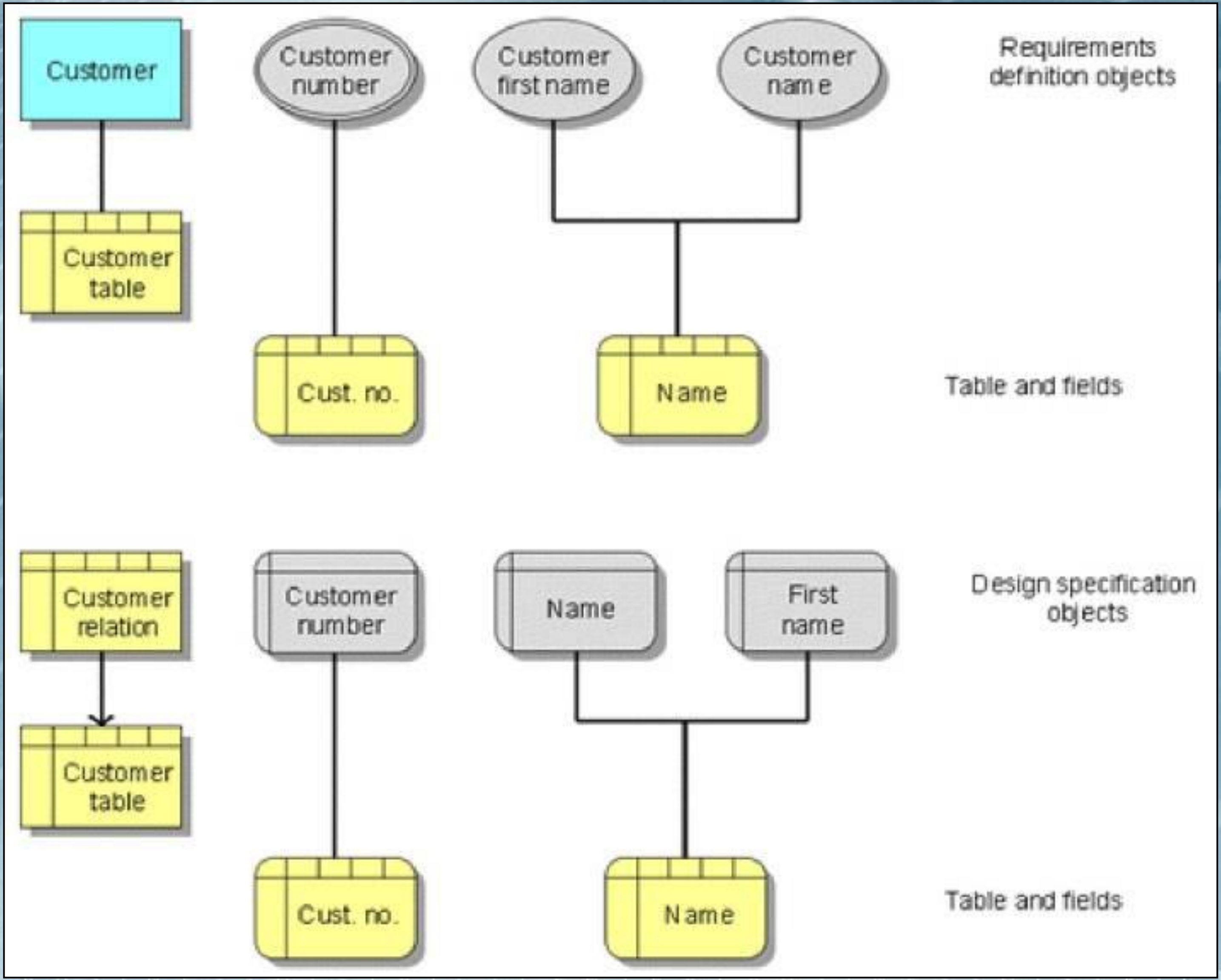


TABLE SPECIMENS

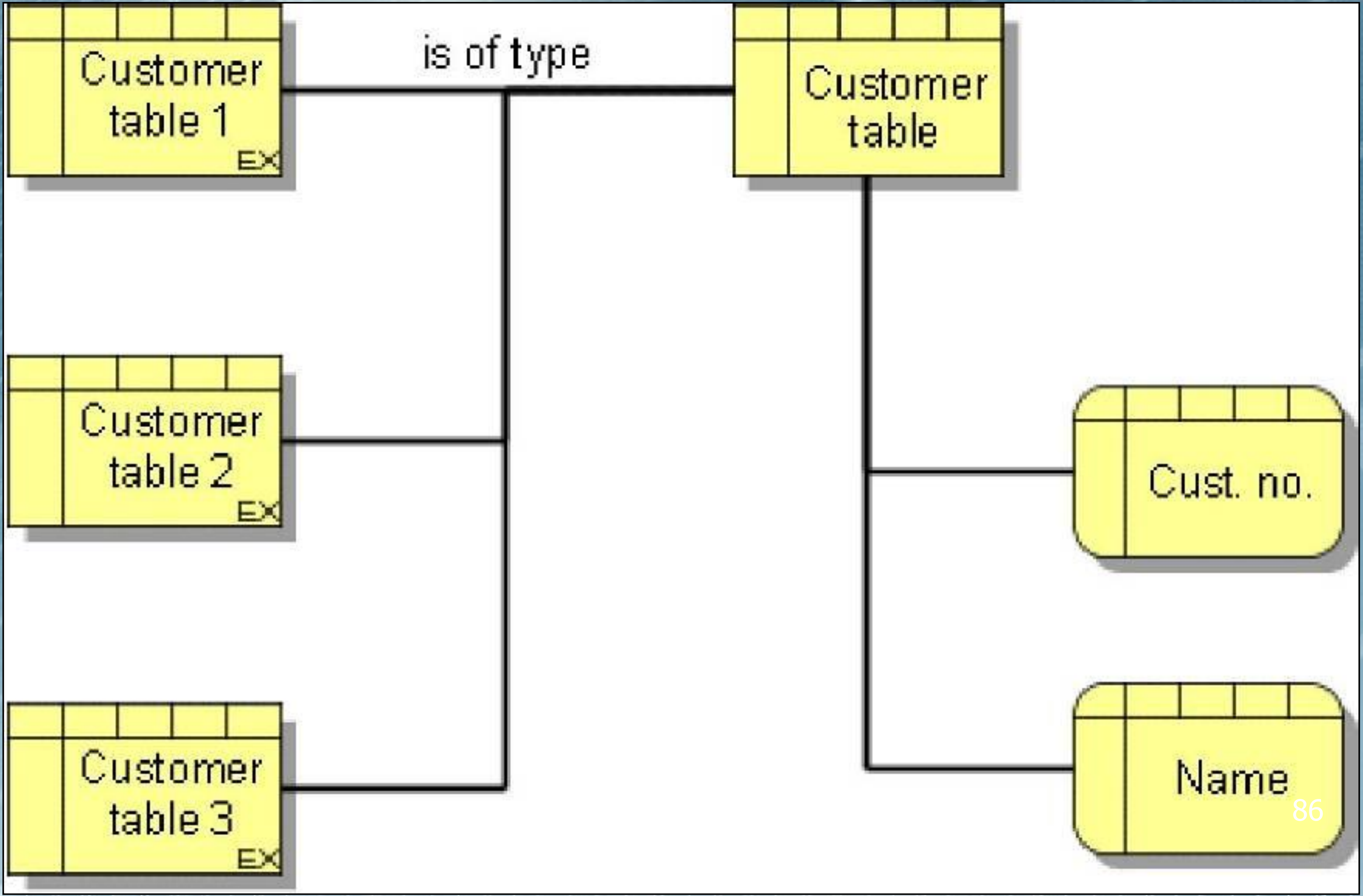
To be able to define the exact location of specific tables and fields in a company, it must be possible to define every single specimen of a table. The same applies when the privileges for accessing tables and fields are to be specified for organizational units.

The Table object type introduced earlier determines the logical structure of a physical table and its fields at the Type level.

However, multiple specimens of every table thus defined may exist on different media or at different locations in a company. This fact can be represented using the Table (specimen) and Field (specimen) object types.

With the help of these objects, the specimen count of a table or a field can be determined exactly.

TABLE SPECIMENS



ORGANIZATION VIEW

Companies are complex social structures that are divided into manageable units. To deal with the given complexity, patterns are defined and rules established. The result of this process is called organization.

In a company's organizational design, a distinction can be made between the organizational structure and the process organization.

The organizational structure encompasses the rules by which the company is statically structured. The process organization contains the rules relating to the tasks to be performed by the company. This task-related structure in the sense of distributing functions to task performers is dealt with in the control view of the ARIS house. The organization view basically looks at a company's organizational structure.

ORGANIZATION VIEW

The design of an ideal company organization with the aim of reducing coordination efforts to a minimum depends on the company's business environment and objectives. Therefore, it is not possible to define universally valid ideal organizational structures that may serve as reference structures.

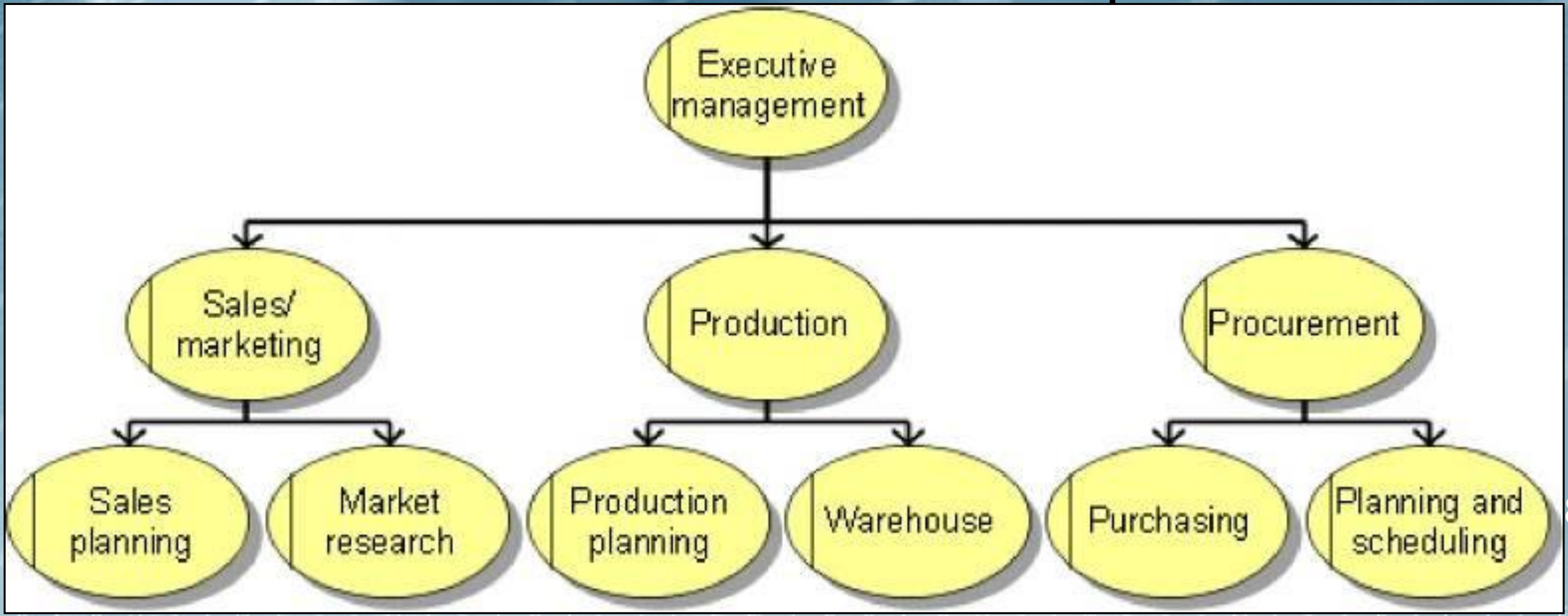
Both the design and use of information systems had their focus on this functional breakdown of companies for a long time. However, looking at integrated process chains in the sense of cohesive processing of similar data objects makes it difficult to establish interrelationships between individual functions for such a structural design.

ORGANIZATION CHART

A typical way of representing organizational structures is the organizational chart. In this chart, organizational units (as task performers) and their interrelationships are represented according to the structuring criteria selected.

Organizational units are the performers of the tasks that must be carried out in order to achieve the business objectives.

Organizational units are linked via relationships.

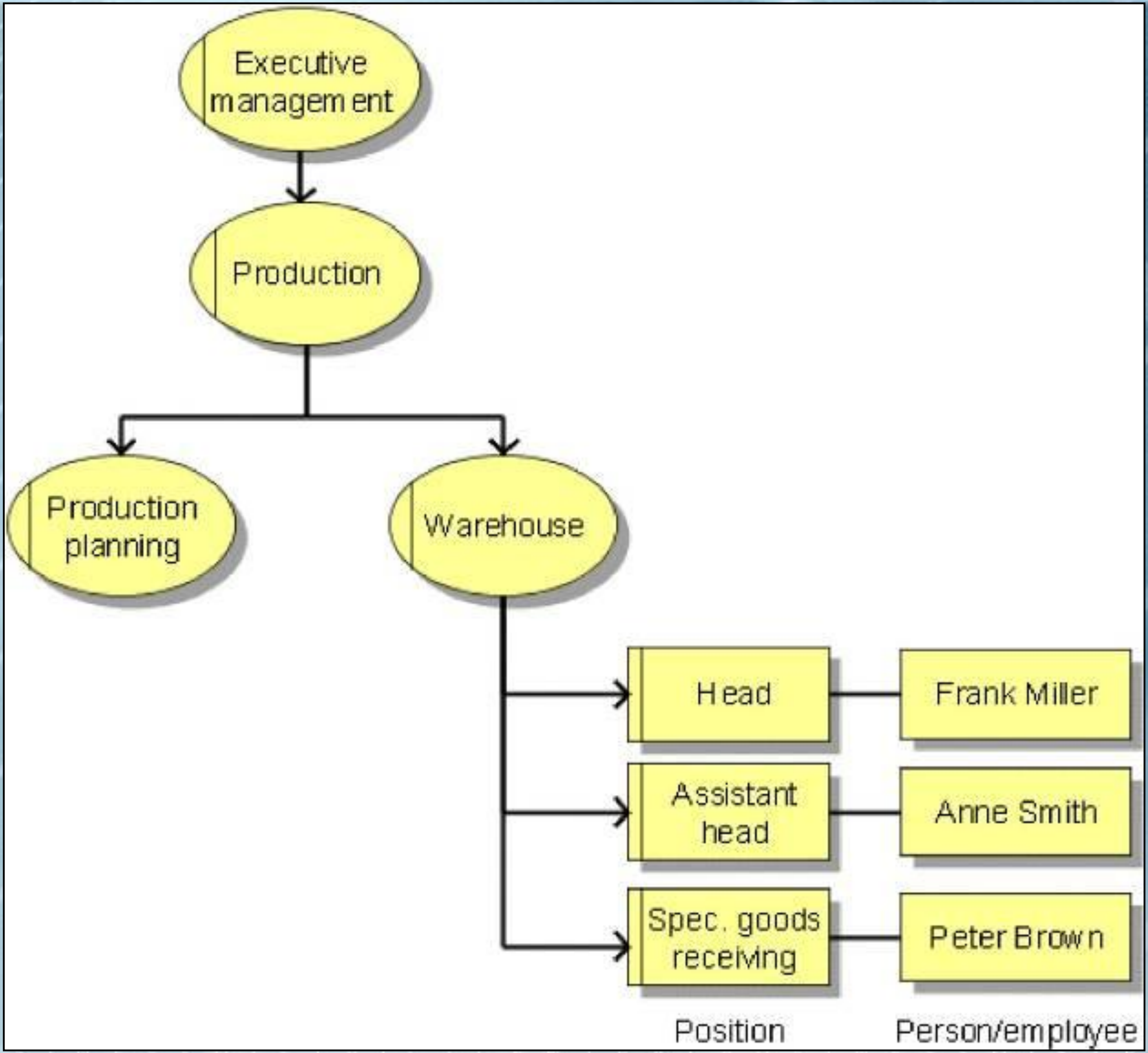


ORGANIZATIONAL CHART WITH POSITION AND PERSON ASSIGNMENT

The Position object type is provided to represent individual positions within the company, for example, positions for which descriptions exist. This object type is illustrated in the following figure. Multiple positions can be assigned to an organizational unit. The meaning of the connections corresponds to the interaction between organizational units.

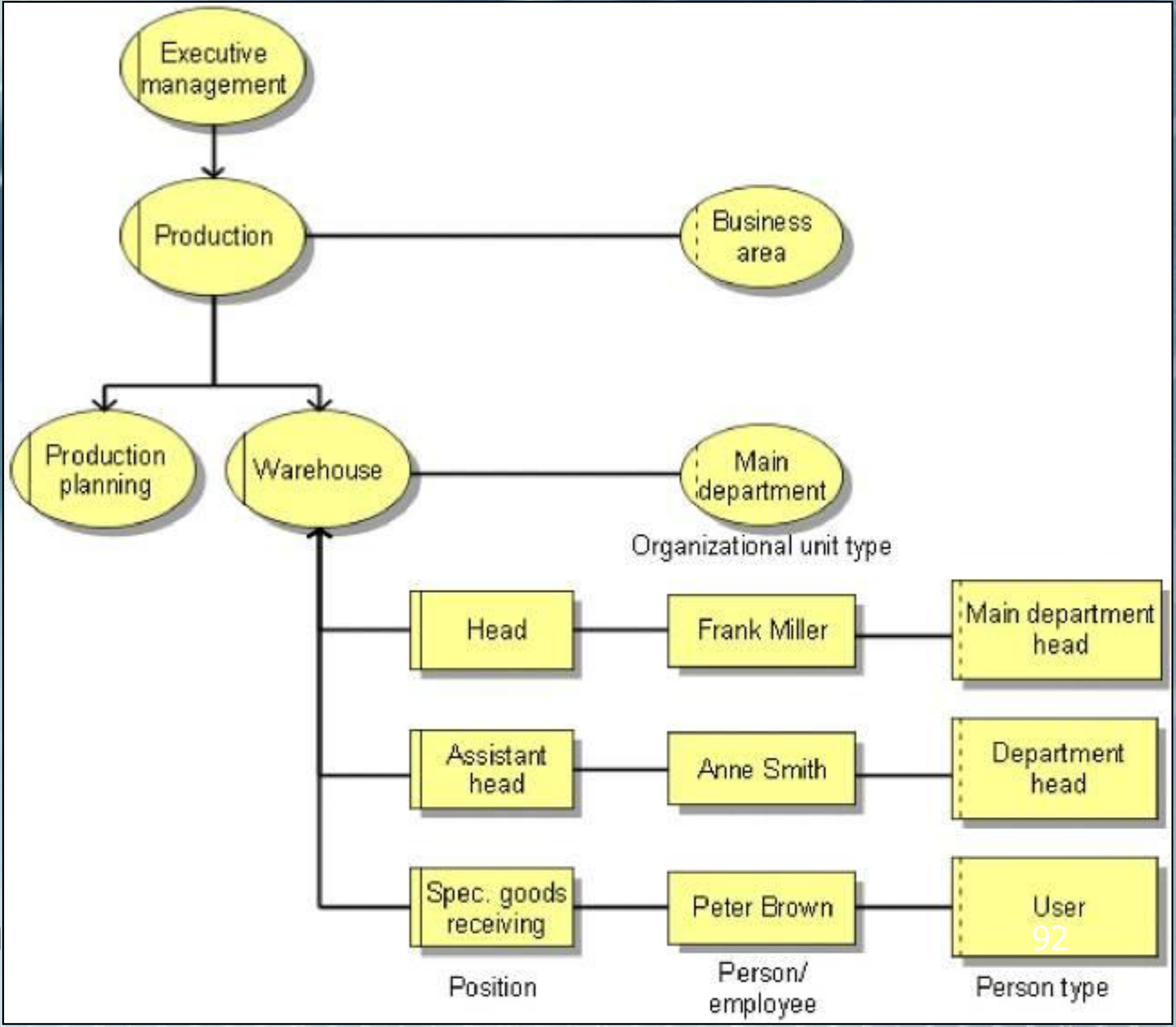
Individual persons in the company can be assigned to the positions and organizational units. ARIS offers separate objects for persons. The assignment of an individual person to an organizational unit shows that this person is assigned as an employee to this organizational unit, whereas the assignment to an individual position defines the current staffing in the company.

ORGANIZATIONAL CHART WITH POSITION AND PERSON ASSIGNMENT



PERSON TYPES

Using these object types enables to depict general business rules derived from concrete organizational units or employees. In process chains, it is possible to define that only specific person types may carry out a function or have access to an information object.



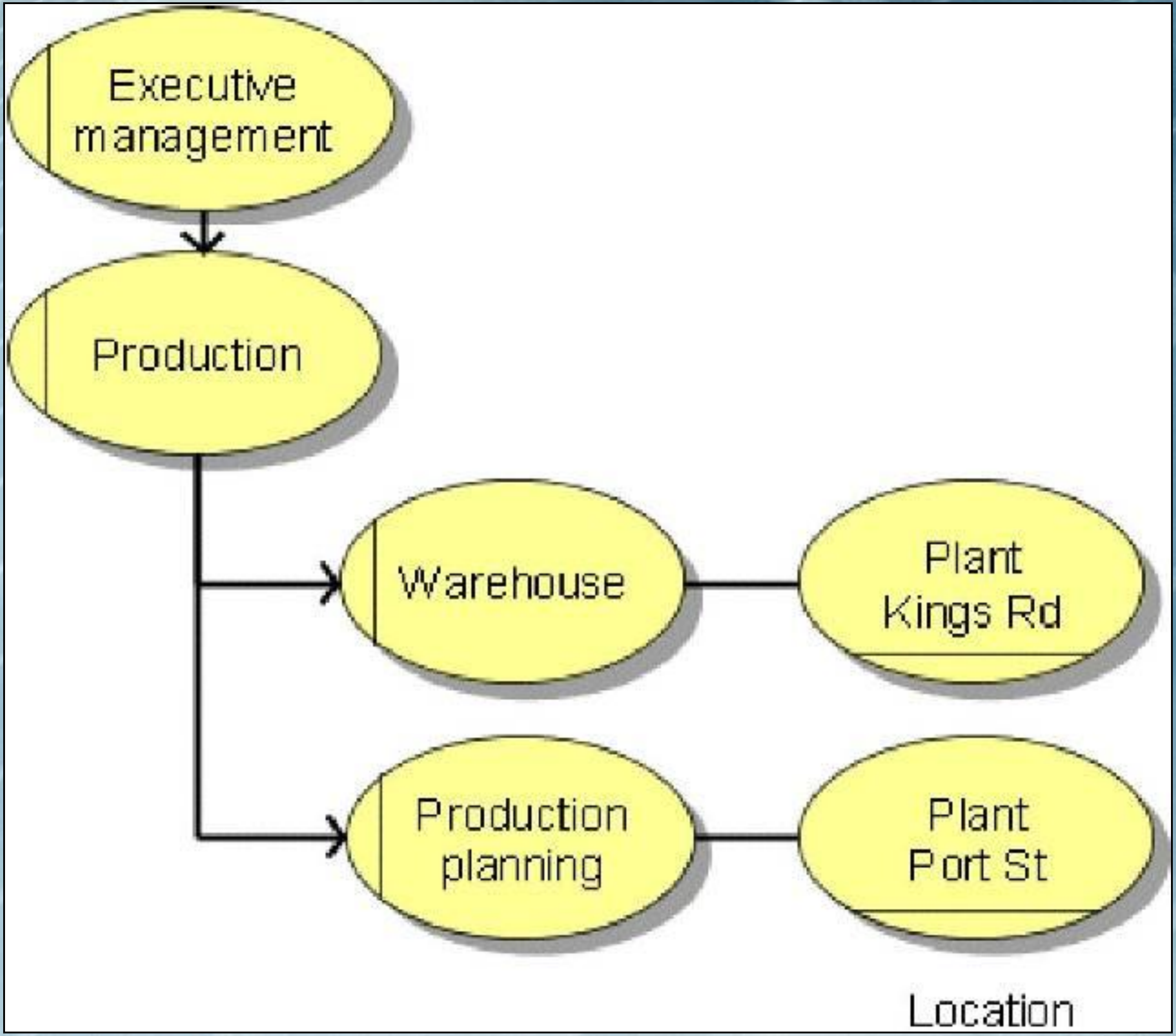
LOCATION ASSIGNMENTS

The modeling of the organizational structure of the company is the starting point for the network topologies to be defined at the design specification level, which are to support this organizational structure as best as possible. Included in the definition of the network topology are network connections and network nodes, which may be found at particular locations of the company.

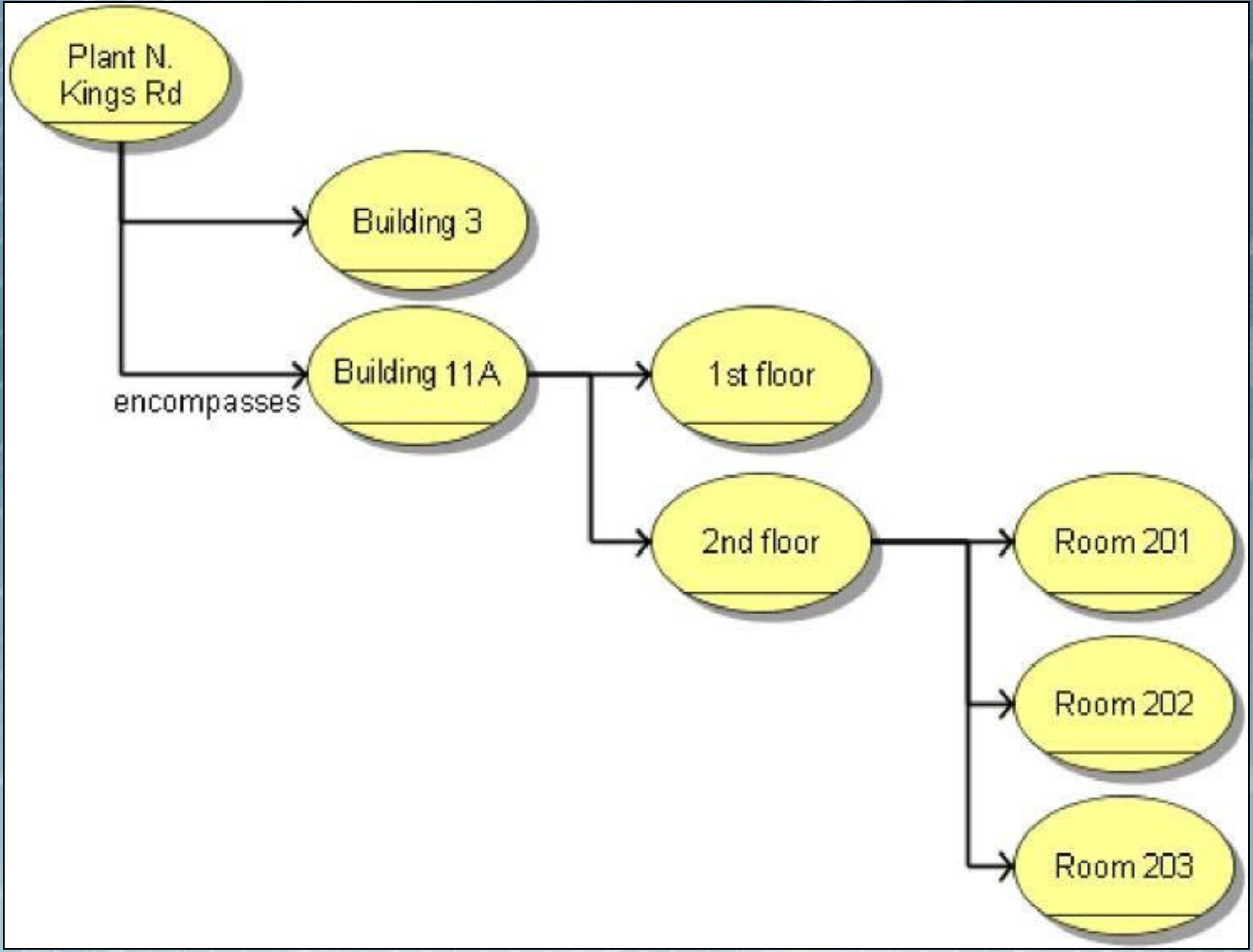
The location of an organizational unit is the most important link between requirements definition and design specification of the organization view. Thus, the location of every organizational unit is already defined in the requirements definition.

Locations may be arranged in any required hierarchy. A location can be an entire plant, a building or, for a more detailed examination, an office through to an individual workstation in a room.

LOCATION ASSIGNMENTS

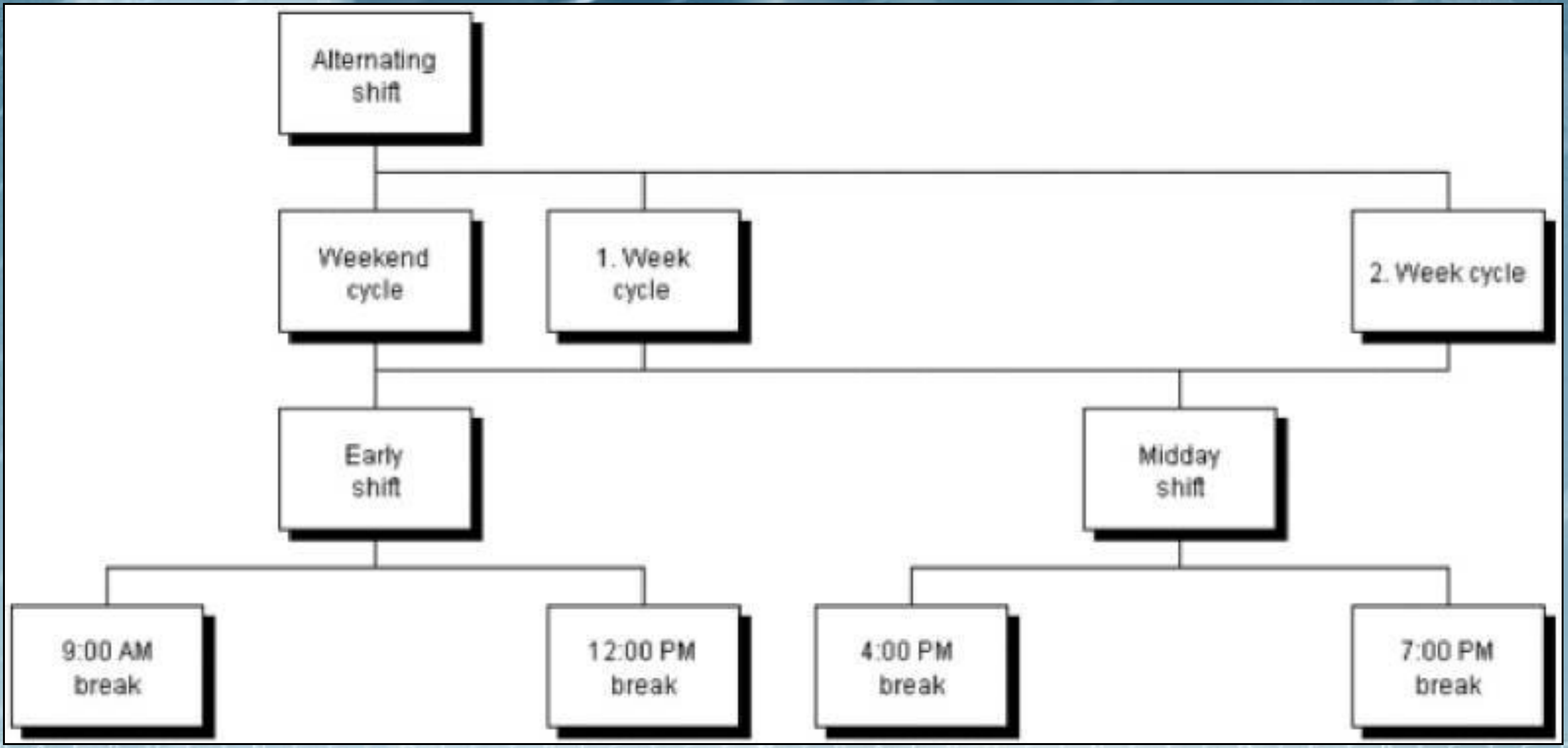


LOCATION HIERARCHIES



SHIFT CALENDAR

A shift calendar is the total number of shift cycles and associated shifts describing the working hours of a resource. This description contains only the part that is repeated periodically; special rules regulating vacation, sick leave, holidays, or other days on which no work is performed are not included here.

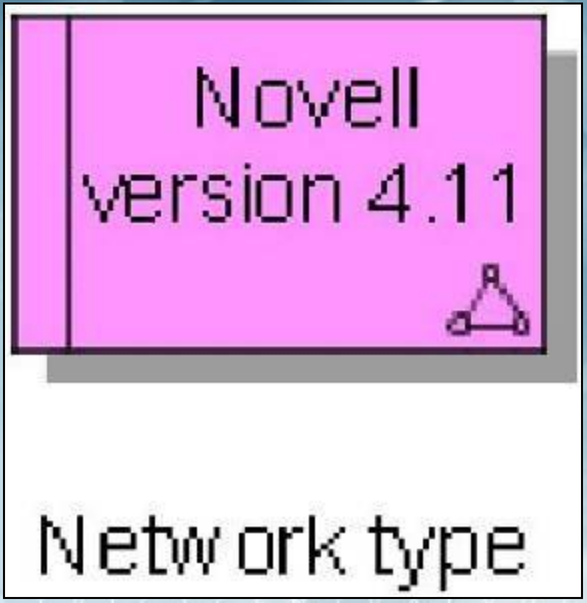


NETWORK TOPOLOGY

The structural requirements for these information systems can generally be defined in the design specification in the form of network topologies.

In a first step, various network types can be incorporated in a Network topology model.

A network type typifies individual network specimens that are based on precisely the same technology.

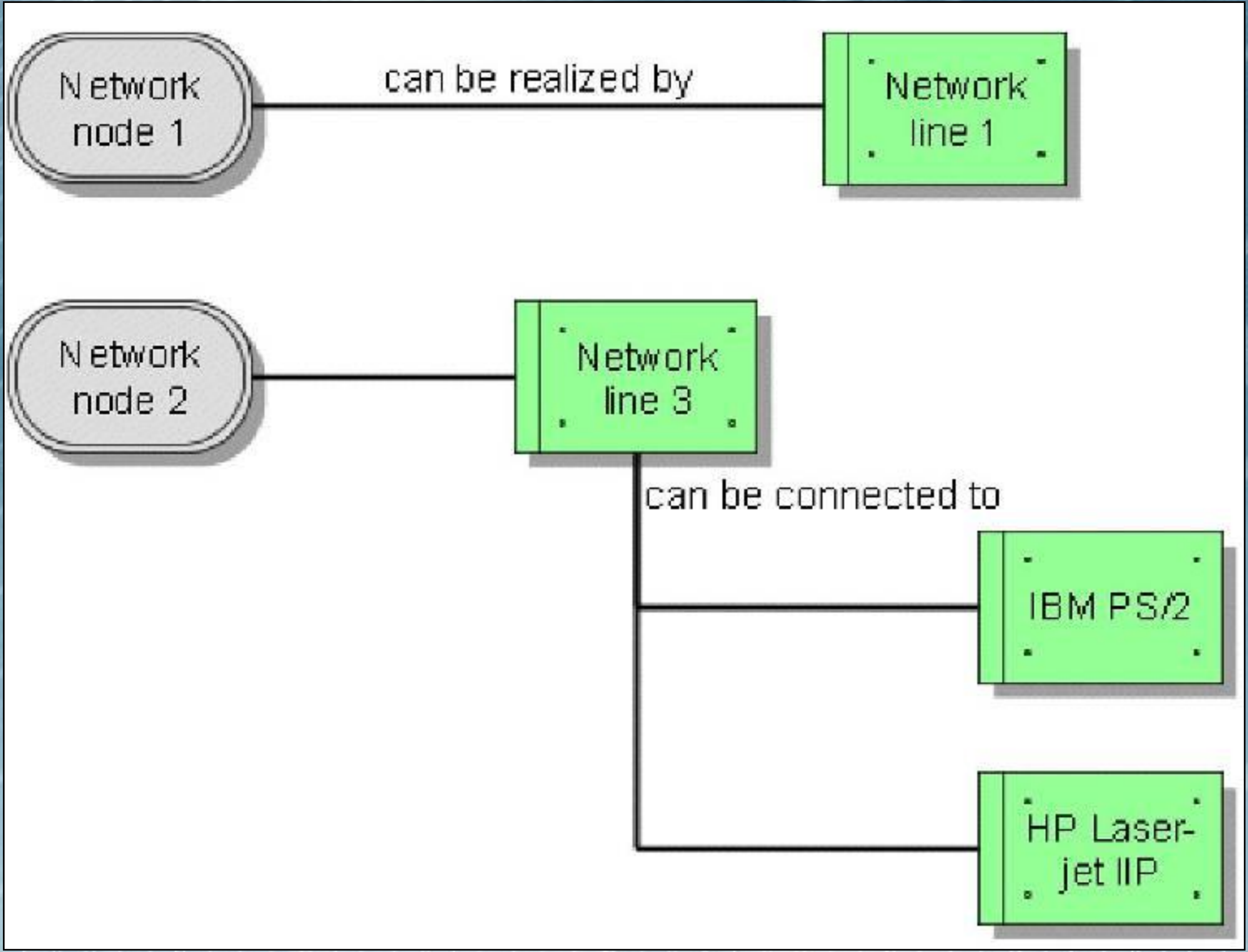


NETWORK TOPOLOGY

The link between network topology and the objects of the requirements definition is established via two approaches:

1. For every single hardware component type the organizational unit or position responsible for it can be specified.
2. It is possible to define for each network type, network node type, network connection type, and hardware component type at which location within the company they may be found. Thus, the location is the central link between the requirements definition and the design specification of the organization view.

NETWORK TOPOLOGY

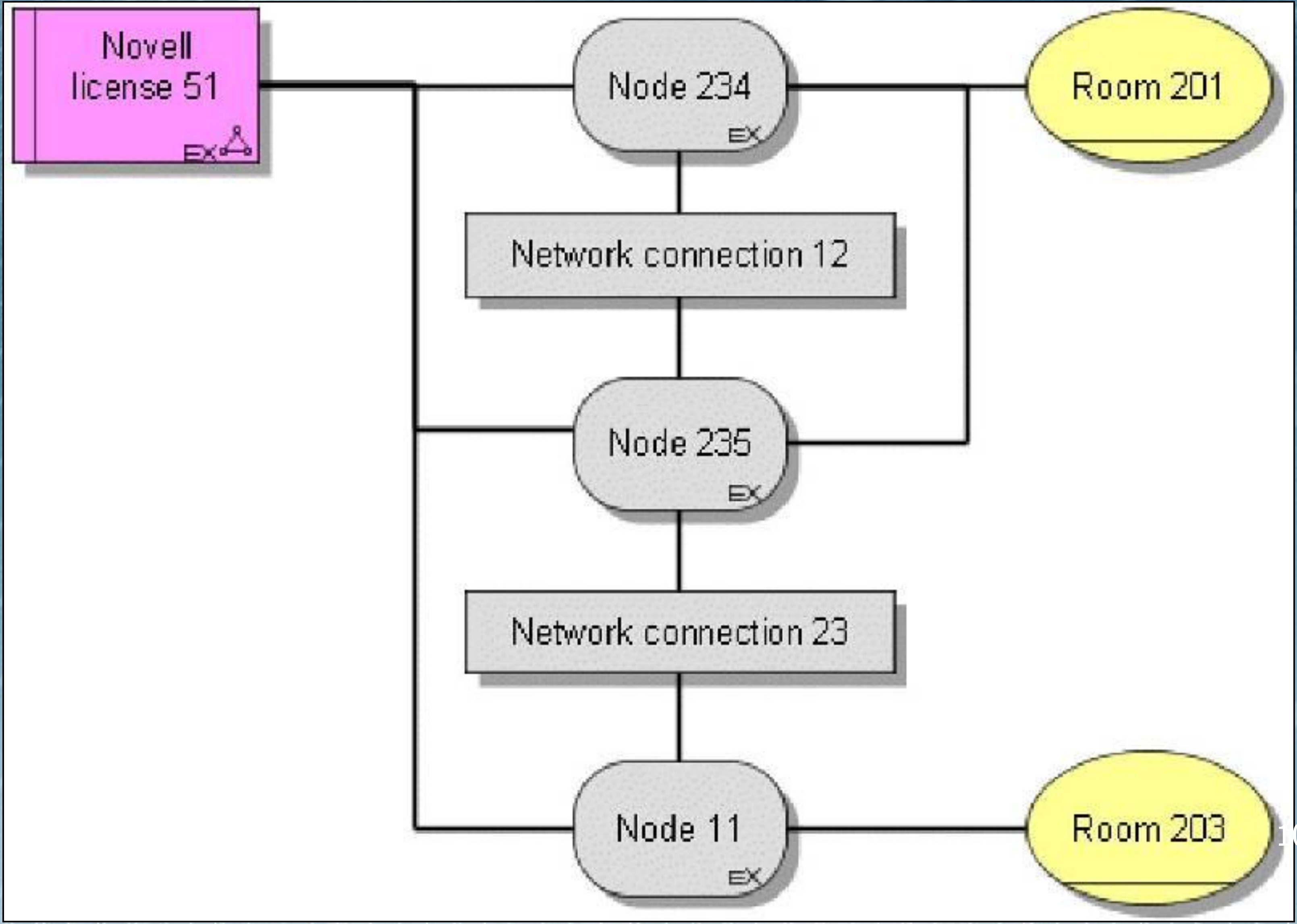


NETWORK DIAGRAM

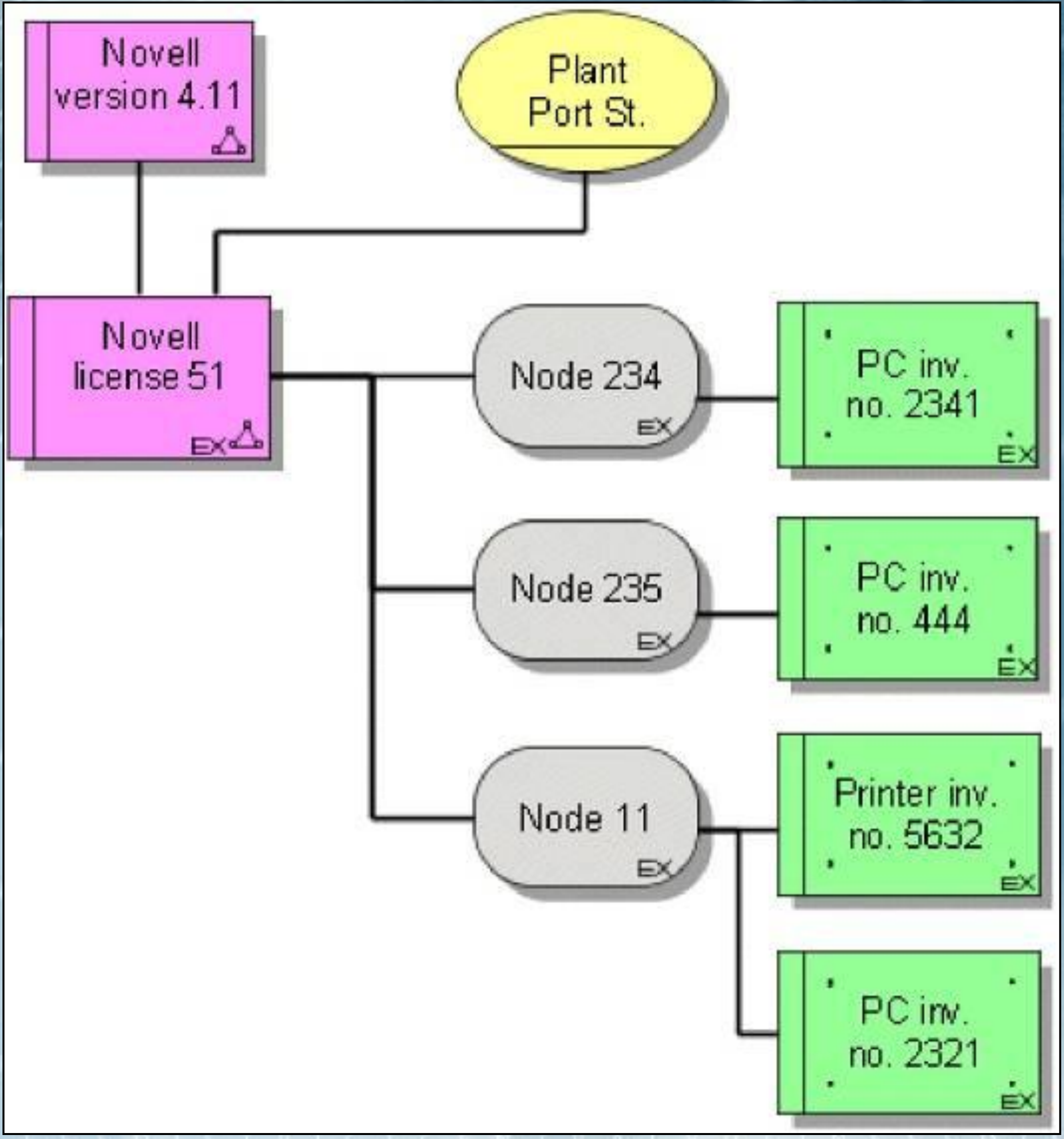
The network diagram illustrates the realization of the network topology defined in the design specification.

The networks that exist in the company are recorded by means of the Network object. It is possible to specify for each network the network nodes and network connections it consists of. The exact location of every network, network node, and network connection within the company can be indicated. A location can be an entire plant, a specific building, a complex of buildings, an office, or an individual workstation.

NETWORK DIAGRAM WITH LOCATION ASSIGNMENT



NETWORK DIAGRAM WITH HARDWARE COMPONENTS AND LOCATION ASSIGNMENT



MATERIAL FLOW MODELING – TECHNICAL RESOURCES

To illustrate the material flow in process models material types are allocated to individual functions of the business process in the form of function input or output. Similar to the allocation of information objects to functions (representation of information transformation by functions), this allocation represents the transformation of input material types to output material types. Additionally, the technical resources required for transforming materials can be recorded in the process chains. In this context, a distinction is made between operating resources, warehouse equipment, transport systems, and technical operating supplies.

MATERIAL FLOW MODELING – TECHNICAL RESOURCES

In the Technical resources model type you can arrange technical resources in a hierarchy, assign a type to them, and classify them. The following object types are available for this purpose:

- ✔ Operating resource. Operating resources are specimens of various operating resource types that are available for a company to perform its tasks. Operating resources are often identified by inventory numbers (e.g., number of a production plant).
- ✔ Operating resource type. An operating resource type typifies individual operating resources that are based on precisely the same technology.

MATERIAL FLOW MODELING – TECHNICAL RESOURCES

- Operating resource class. Similar operating resource types can be combined to form an operating resource class. The similarity can be based on different classification criteria. Thus, an operating resource type can be assigned to multiple operating resource classes.
- Warehouse equipment. Warehouse equipment items are specimens of various warehouse equipment types that are available for a company to perform its tasks. Warehouse equipment items are often identified by inventory numbers.
- Warehouse equipment type. A warehouse equipment type typifies individual warehouse equipment items that are based on precisely the same technology.

MATERIAL FLOW MODELING – TECHNICAL RESOURCES

- Warehouse equipment class. Similar warehouse equipment types can be combined to form a warehouse equipment class. The similarity can be based on different classification criteria. Thus, a warehouse equipment type can be assigned to multiple warehouse equipment classes.
- Technical operating supply. A technical operating supply is an individual specimen of a technical operating supply type. In general, it can be identified by means of an inventory number.
- Technical operating supply type. A technical operating supply type typifies individual technical operating supply items that are based on precisely the same technology.

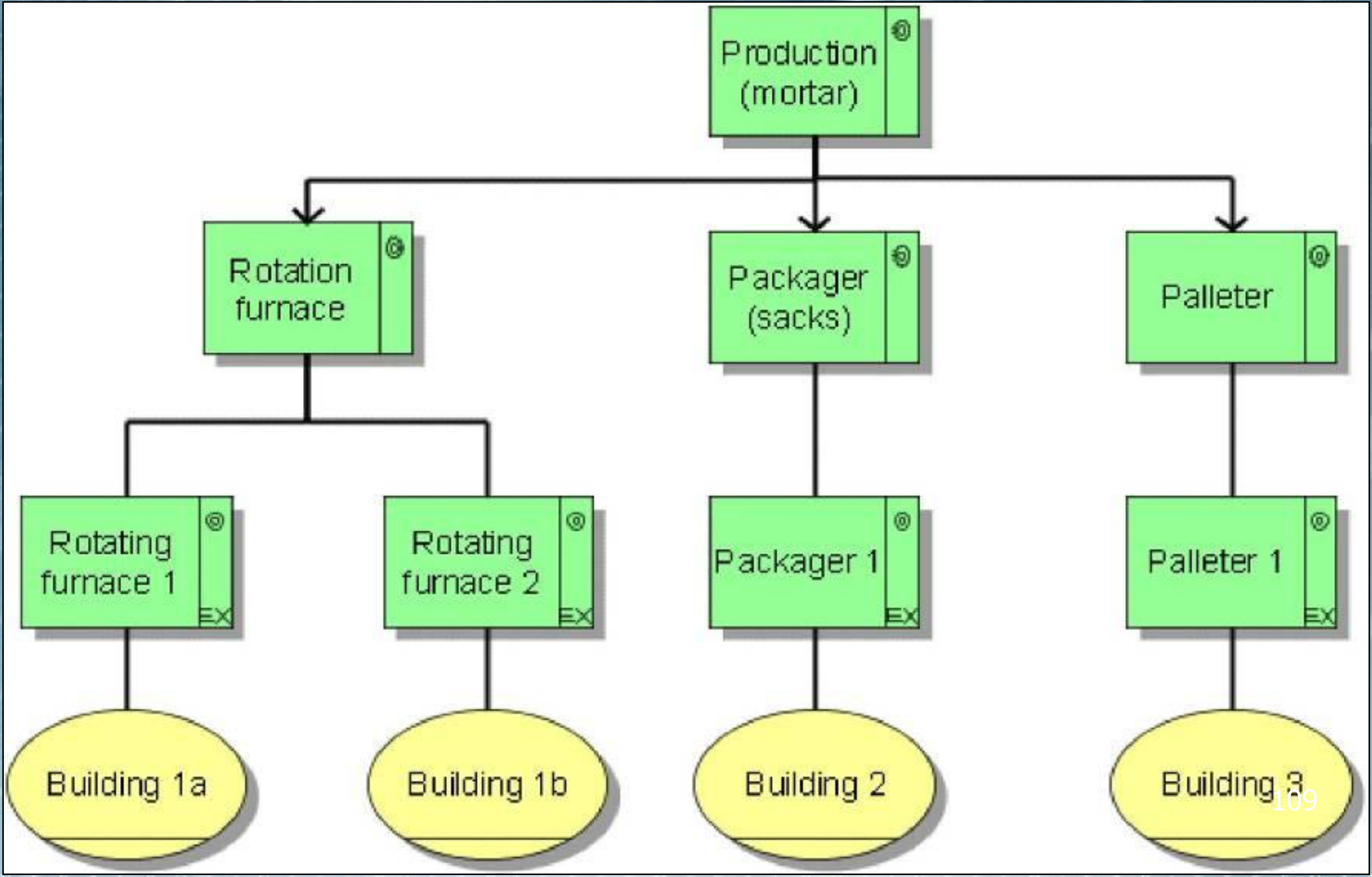
MATERIAL FLOW MODELING – TECHNICAL RESOURCES

- ✓ Technical operating supply class. Similar technical operating supply types can be combined to form a technical operating supply class. The similarity can be based on different classification criteria. Thus, a technical operating supply type can be assigned to multiple technical operating supply classes.
- ✓ Transport system. A transport system is an individual specimen of a transport system type. In general, it can be identified by means of an inventory number or a plant number.
- ✓ Transport system type. A transport system type typifies individual transport systems that are based on precisely the same technology.

MATERIAL FLOW MODELING – TECHNICAL RESOURCES

- ✓ Transport system class. Similar transport system types can be combined to form a transport system class. The similarity can be based on different classification criteria. Thus, a transport system type can be assigned to multiple transport system classes.

EXAMPLE OF A “TECHNICAL RESOURCES” MODEL



PROCESS VIEW / CONTROL VIEW

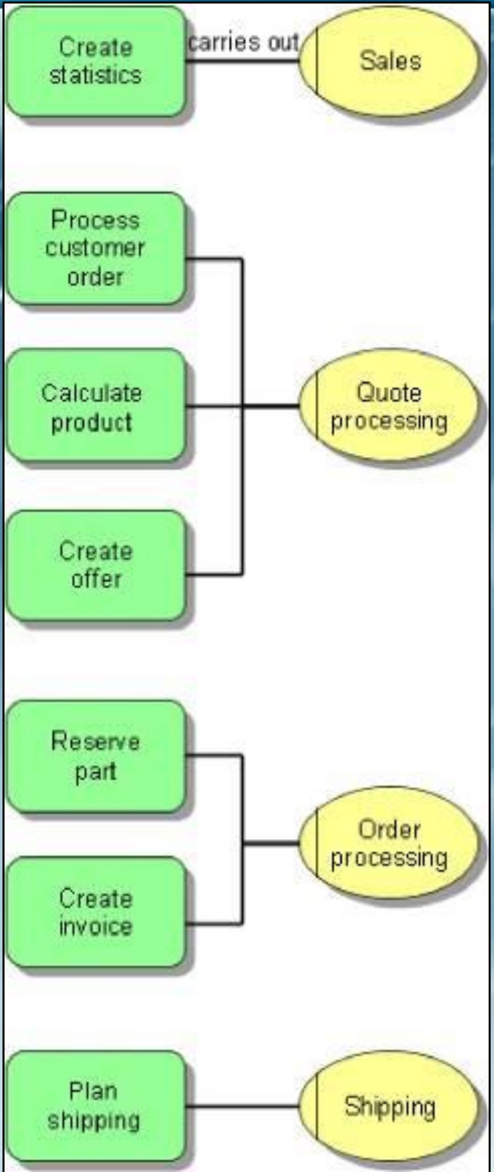
The relationships between the objects of the data, organization, and function views are analyzed in the control/process view. The relationships to be analyzed result from the connections between the views.

First, the relationships between two views are examined, then diagrams are introduced, illustrating the relationships between all three views.

LINKING FUNCTIONS WITH ORGANIZATION

Linking the function view with the organization view serves to allocate the functions defined in the function tree to the task performers (organizational units) of the organizational chart. This allocation defines an organizational unit's responsibility and decision-making power with regard to its allocated functions. Looking at how these organizational allocations are realized in a process chain (business processes) enables to identify the degree of functional integration, i.e., the number of business process functions that are to be processed by an organizational unit.

ALLOCATION OF ORGANIZATIONAL ELEMENTS TO FUNCTIONS



EVENT-DRIVEN PROCESS CHAIN (EPC)

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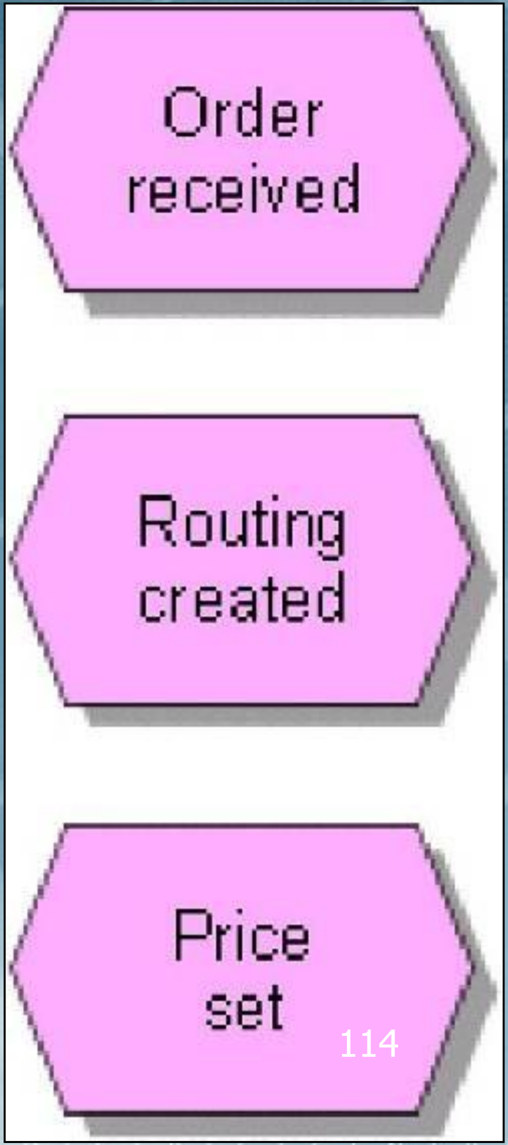
EVENTS

The operational sequence of functions in the sense of business processes is represented in process chains. The start and end events of every function can be specified.

An event describes the fact that an information object has taken on a business management-relevant state that controls or influences the progression of the business process. Events trigger functions and are the results of functions. Unlike a function, which is a time-consuming task, an event relates to one point in time.

Events are graphically represented as hexagons. The name should not only contain the information object itself but also its state change

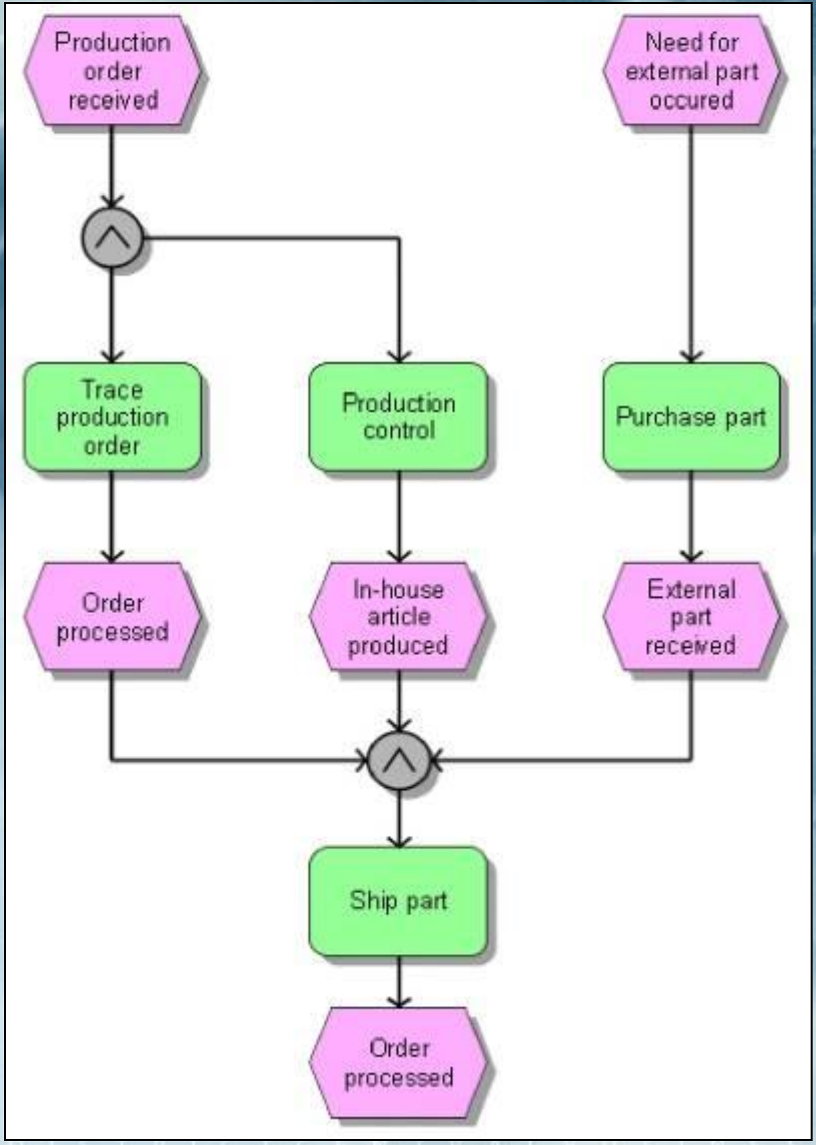


EVENT-DRIVEN PROCESS CHAIN (EPC)

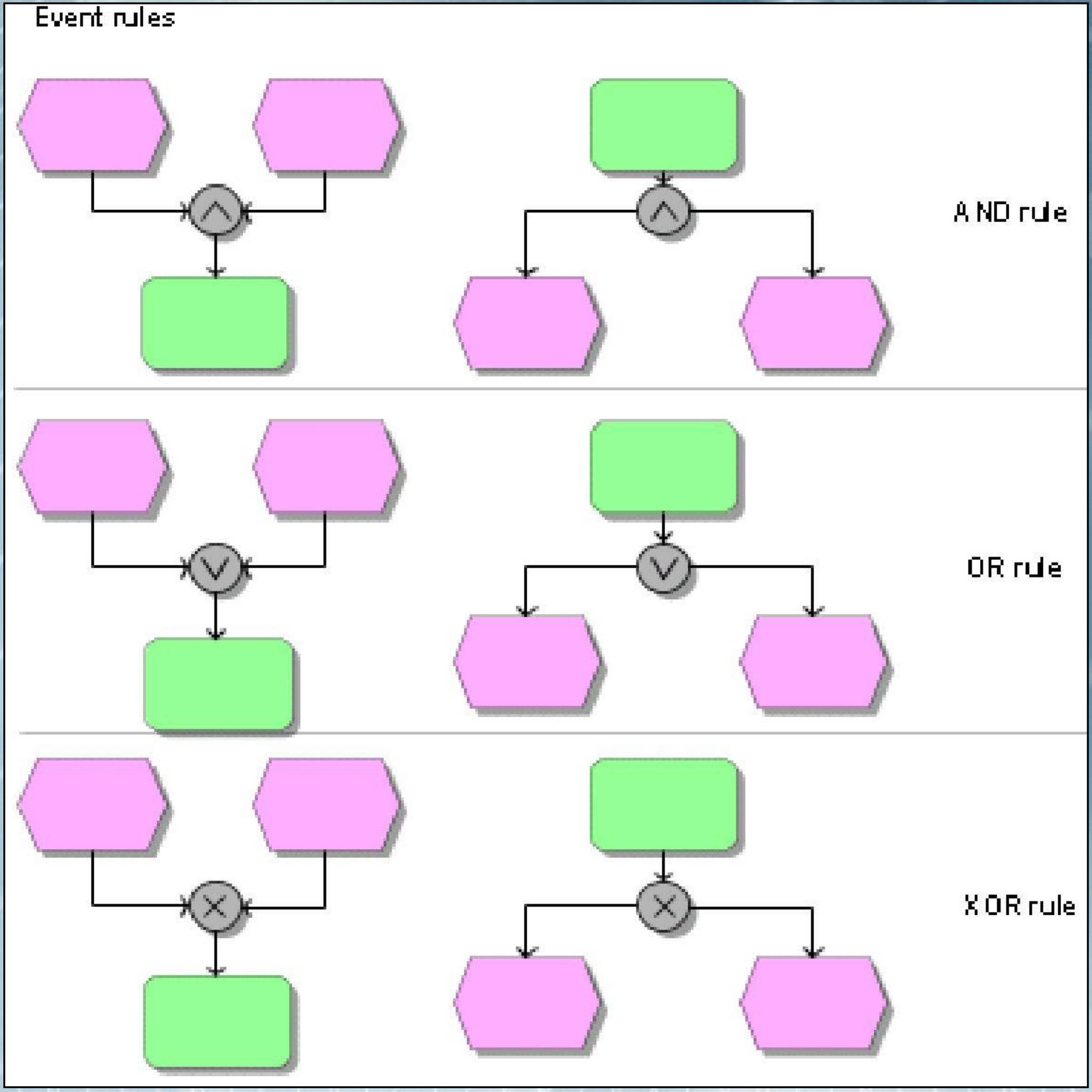
Events trigger functions and are the results of functions. By arranging events and functions in a sequence, Event-driven process chains (EPCs) are created.

An event-driven process chain (EPC) shows the chronological-logical operational sequence of a business process. Since events determine which state or condition will trigger a function and which state will define the end of a function, the start and end nodes of such an EPC are always events. Multiple functions can originate from one event simultaneously, and a function can have multiple events as its result. A rule that is represented by a circle is used to illustrate branches and processing loops in an EPC. However, these connections do not only serve as graphic operators, but define the logical links between the objects they connect.

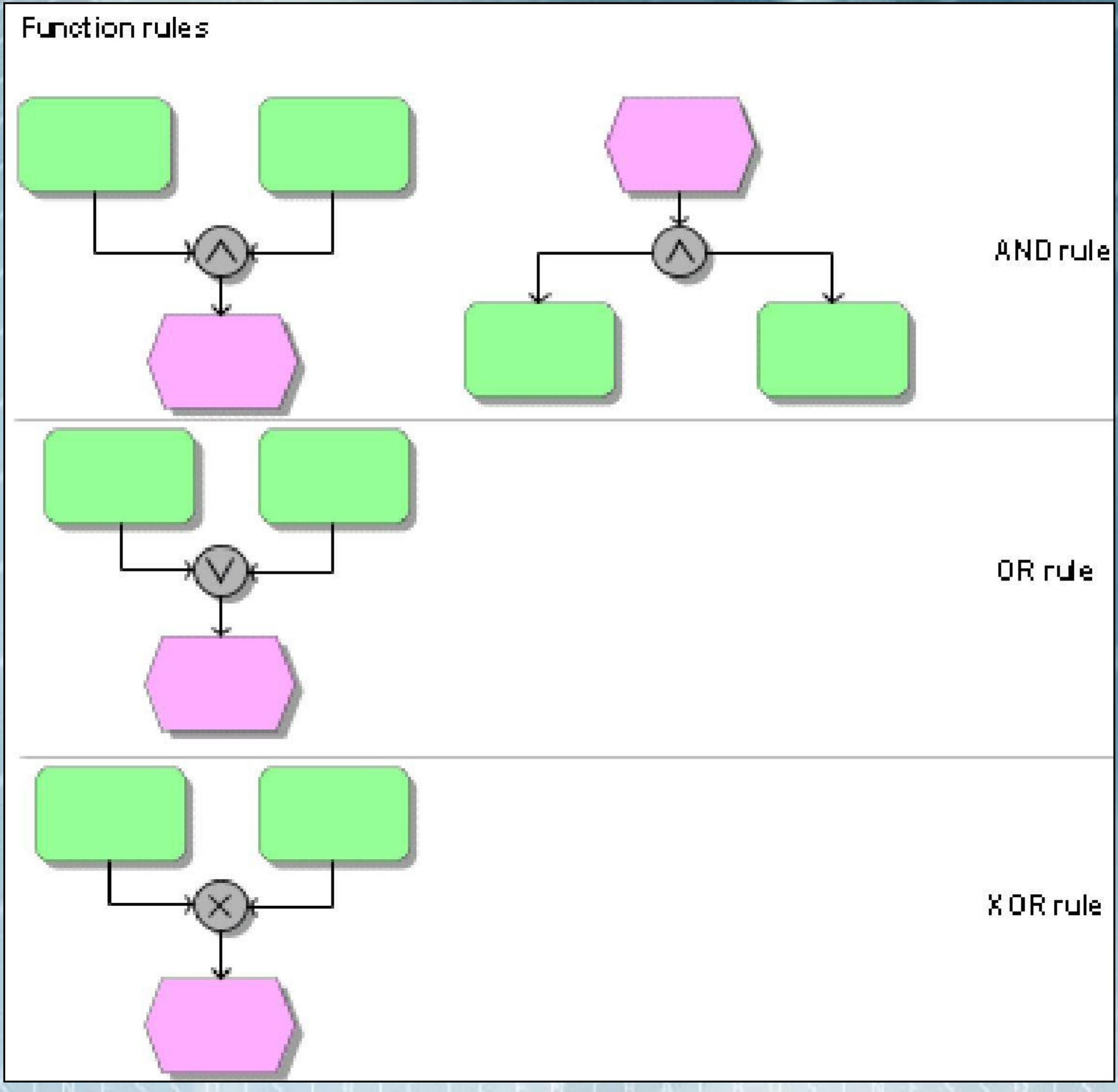
EVENT-DRIVEN PROCESS CHAIN (EPC)



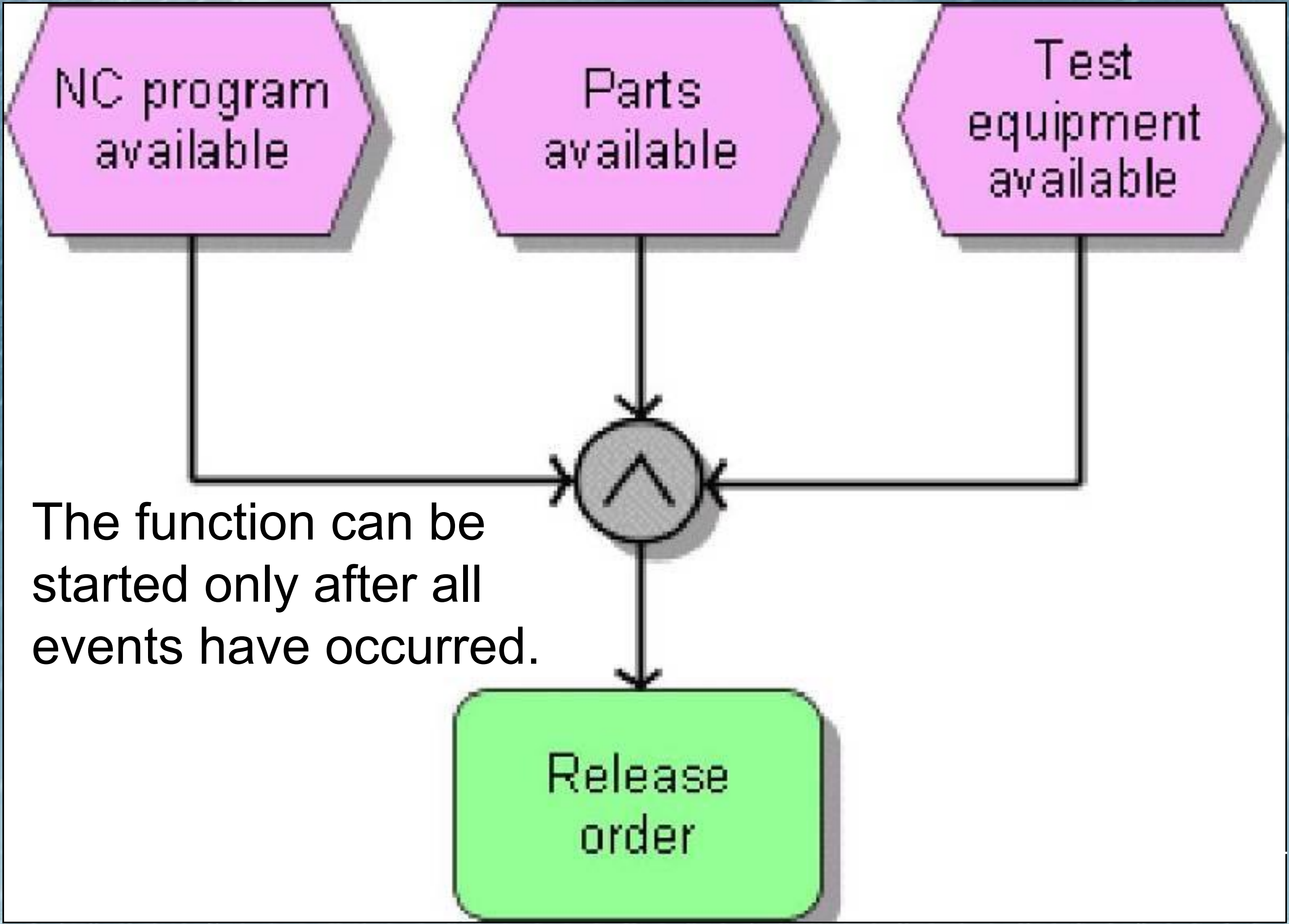
LOGIC OPERATORS (RULES)



LOGIC OPERATORS (RULES)

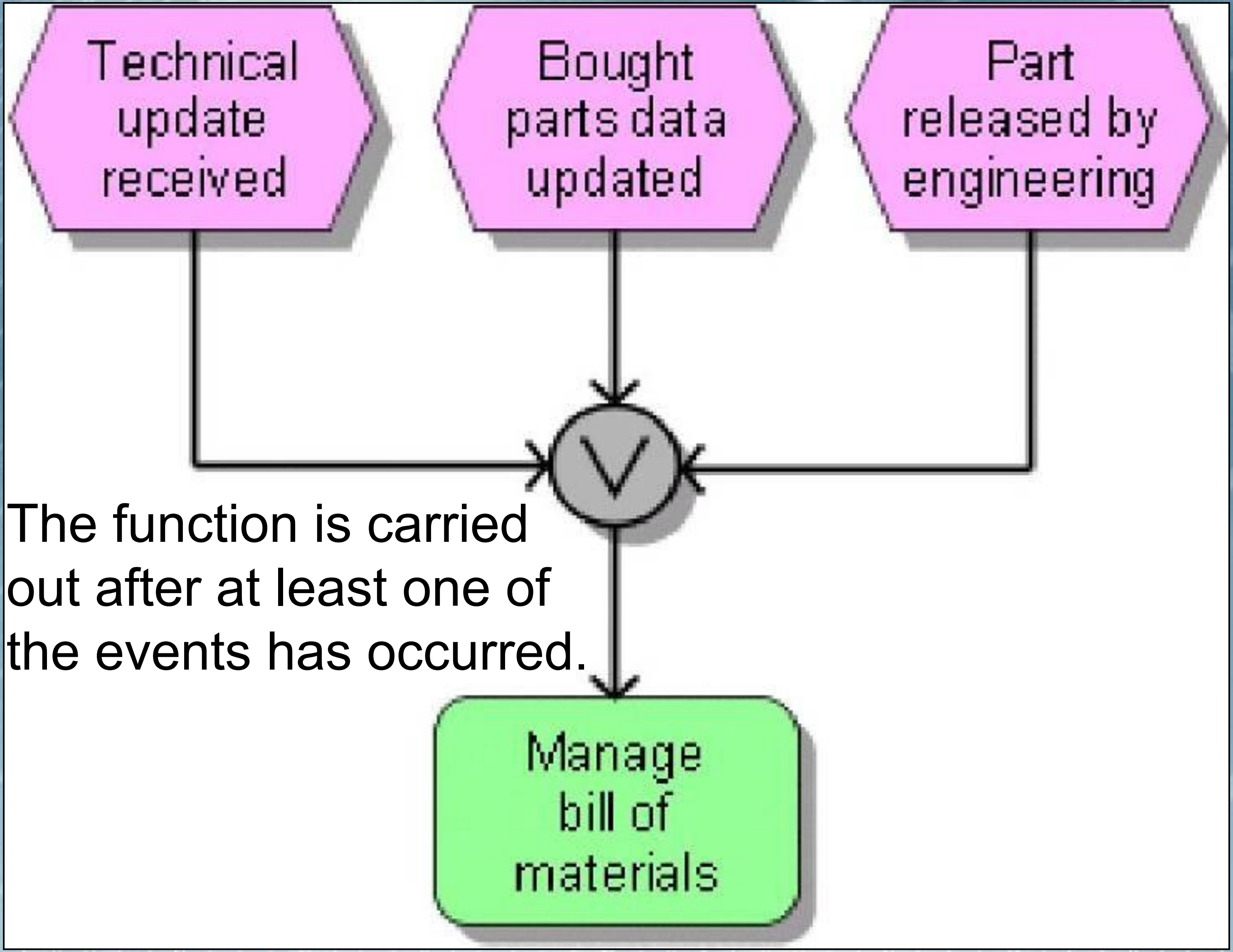


AND OPERATOR FOR TRIGGERING EVENTS



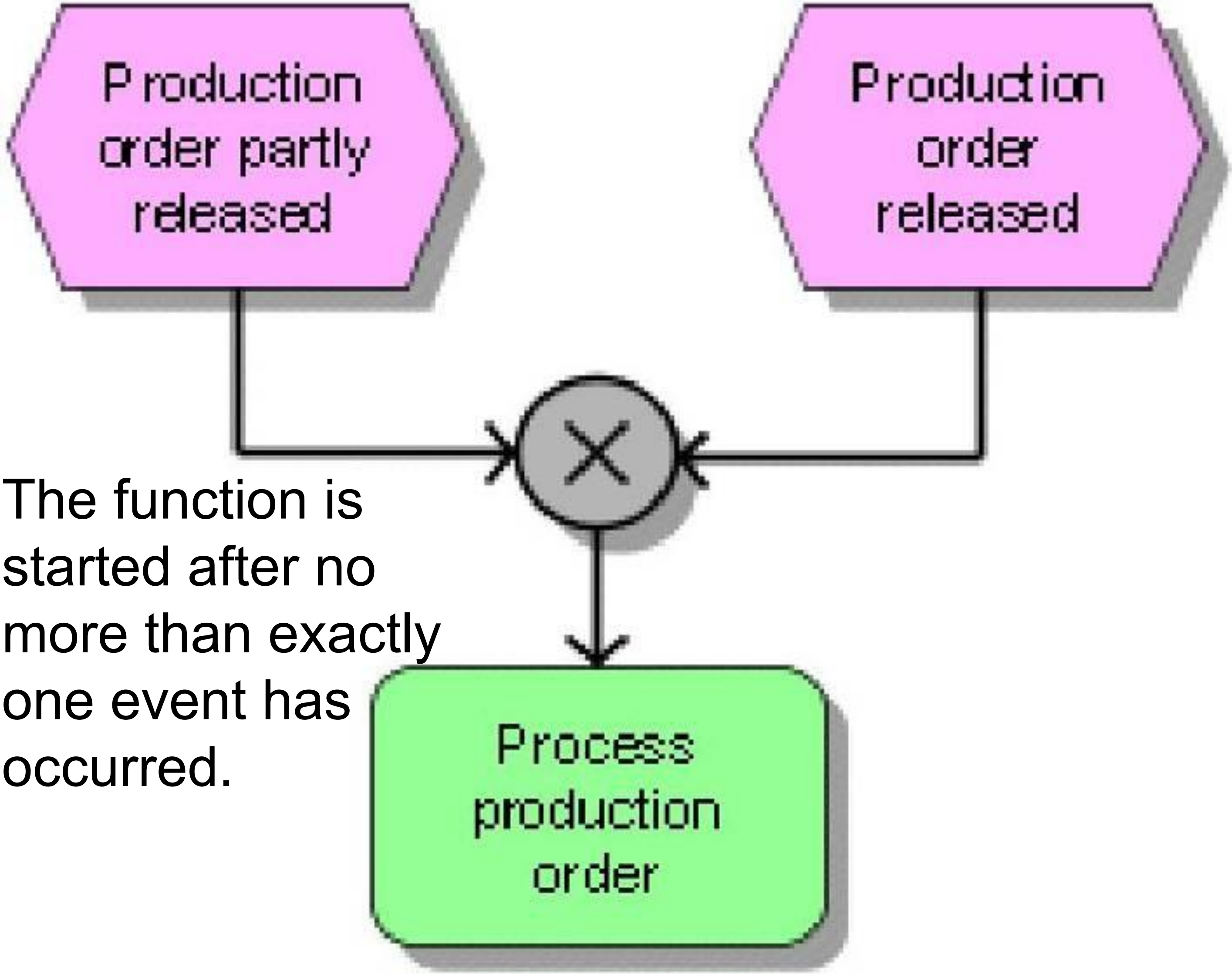
The function can be started only after all events have occurred.

OR OPERATOR FOR TRIGGERING EVENTS


Technical update received
Bought parts data updated
Part released by engineering
∨
Manage bill of materials

The function is carried out after at least one of the events has occurred.

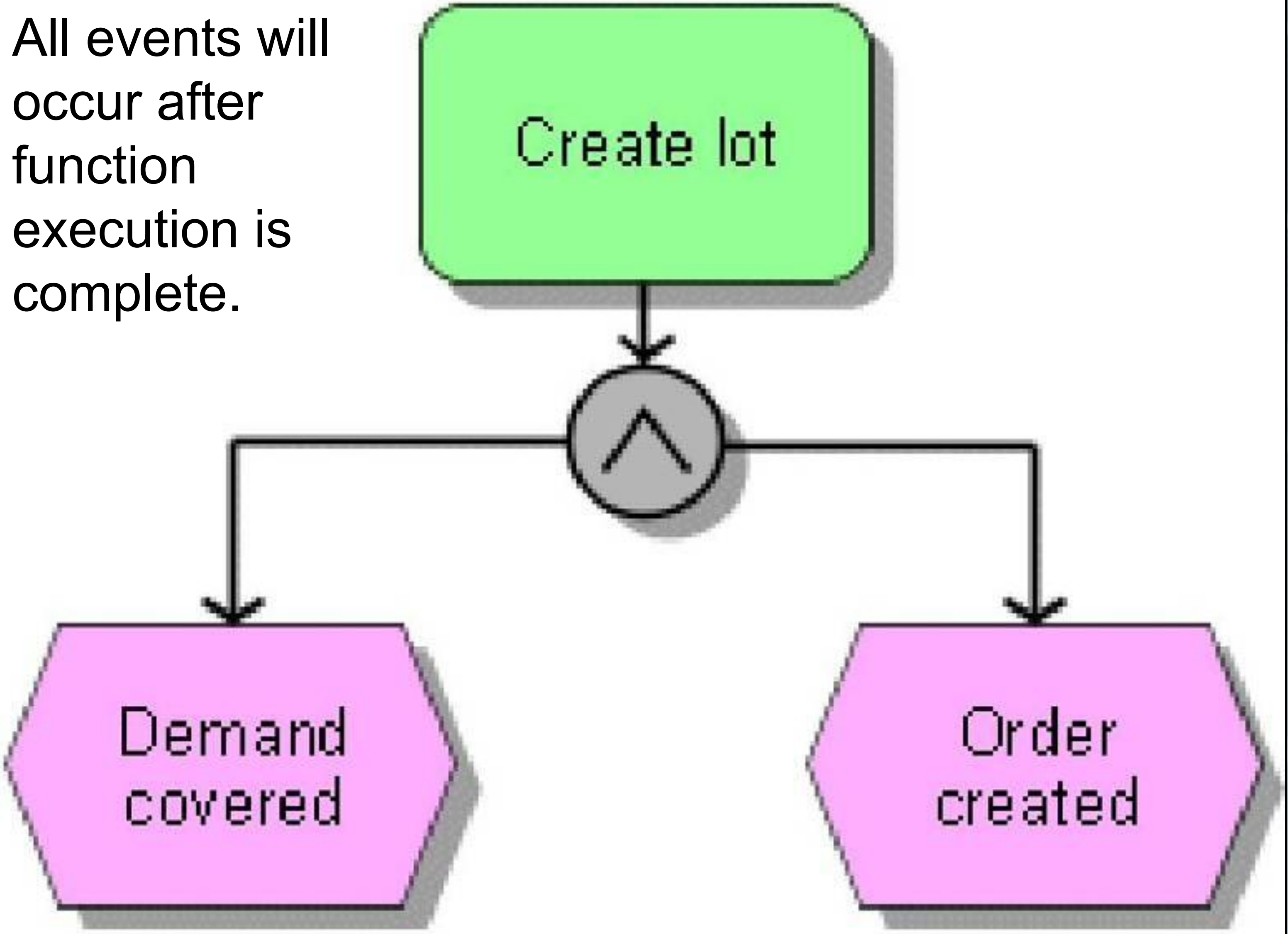
EXLUSIVE OR (XOR) OPERATOR FOR TRIGGERING EVENTS



The function is started after no more than exactly one event has occurred.

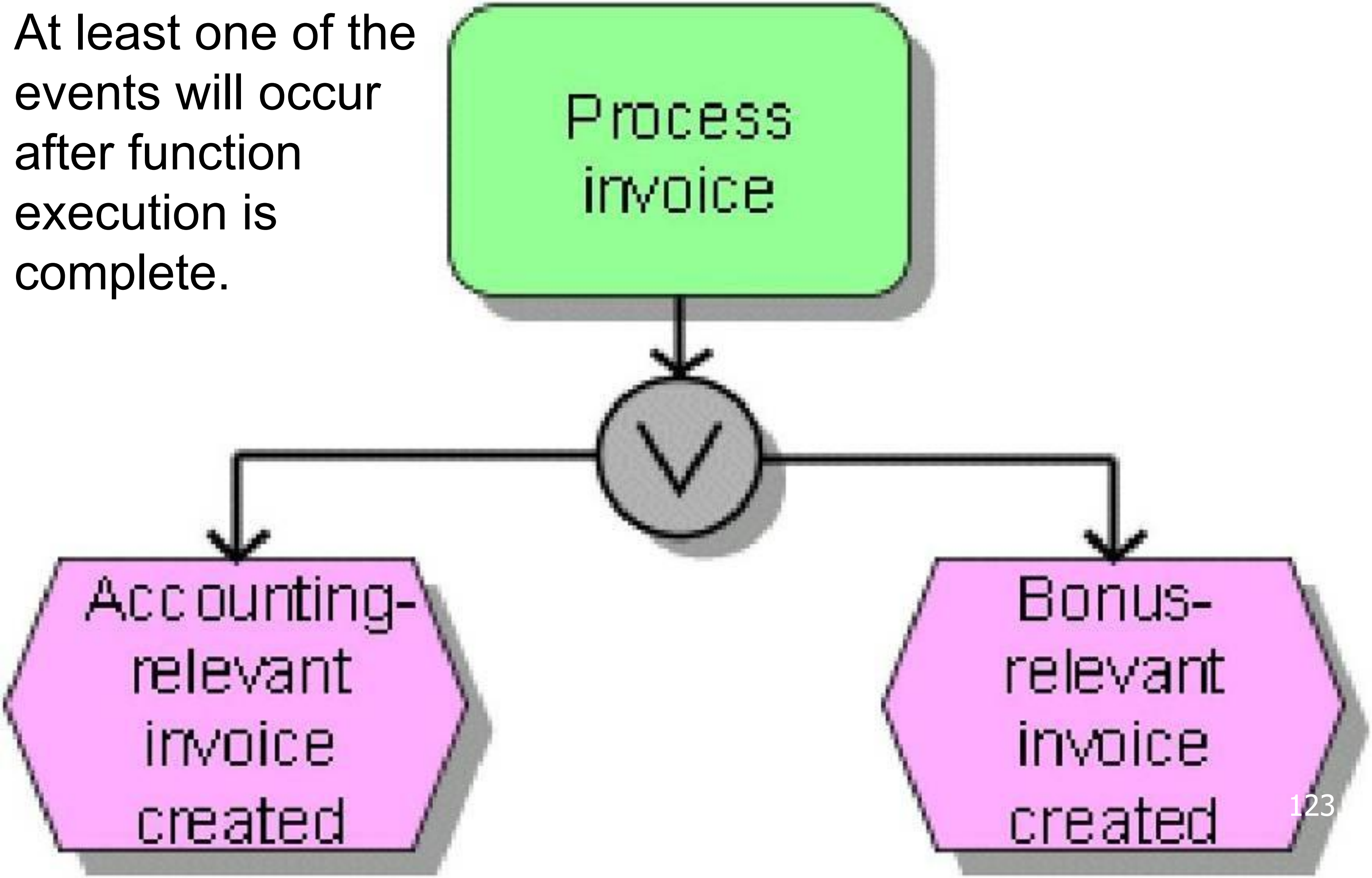
AND OPERATOR FOR CREATED EVENTS

All events will occur after function execution is complete.



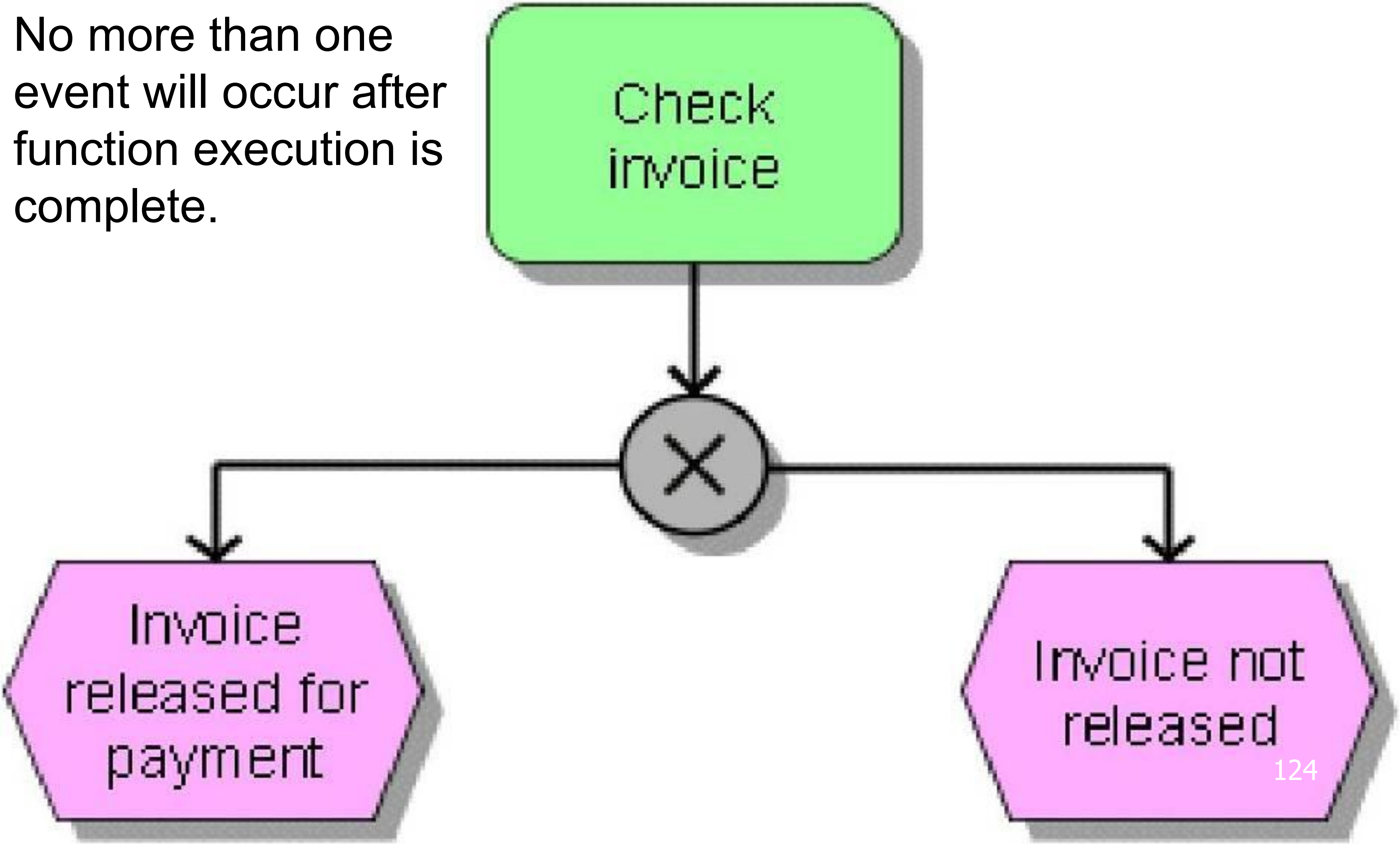
OR OPERATOR FOR CREATED EVENTS

At least one of the events will occur after function execution is complete.

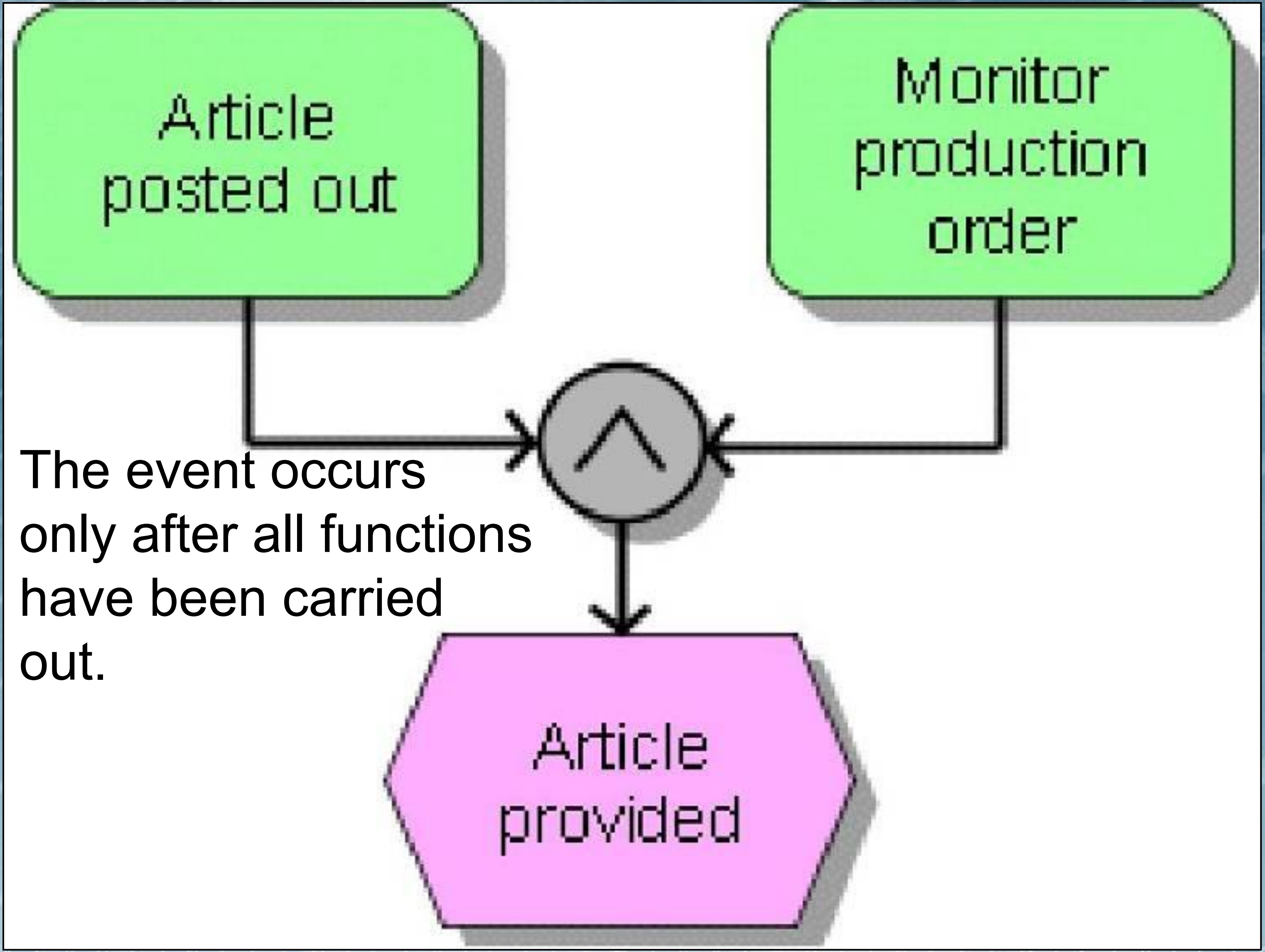

Process invoice
∨
Accounting-relevant invoice created
Bonus-relevant invoice created

EXLUSIVE OR (XOR) OPERATOR FOR CREATED EVENTS

No more than one event will occur after function execution is complete.

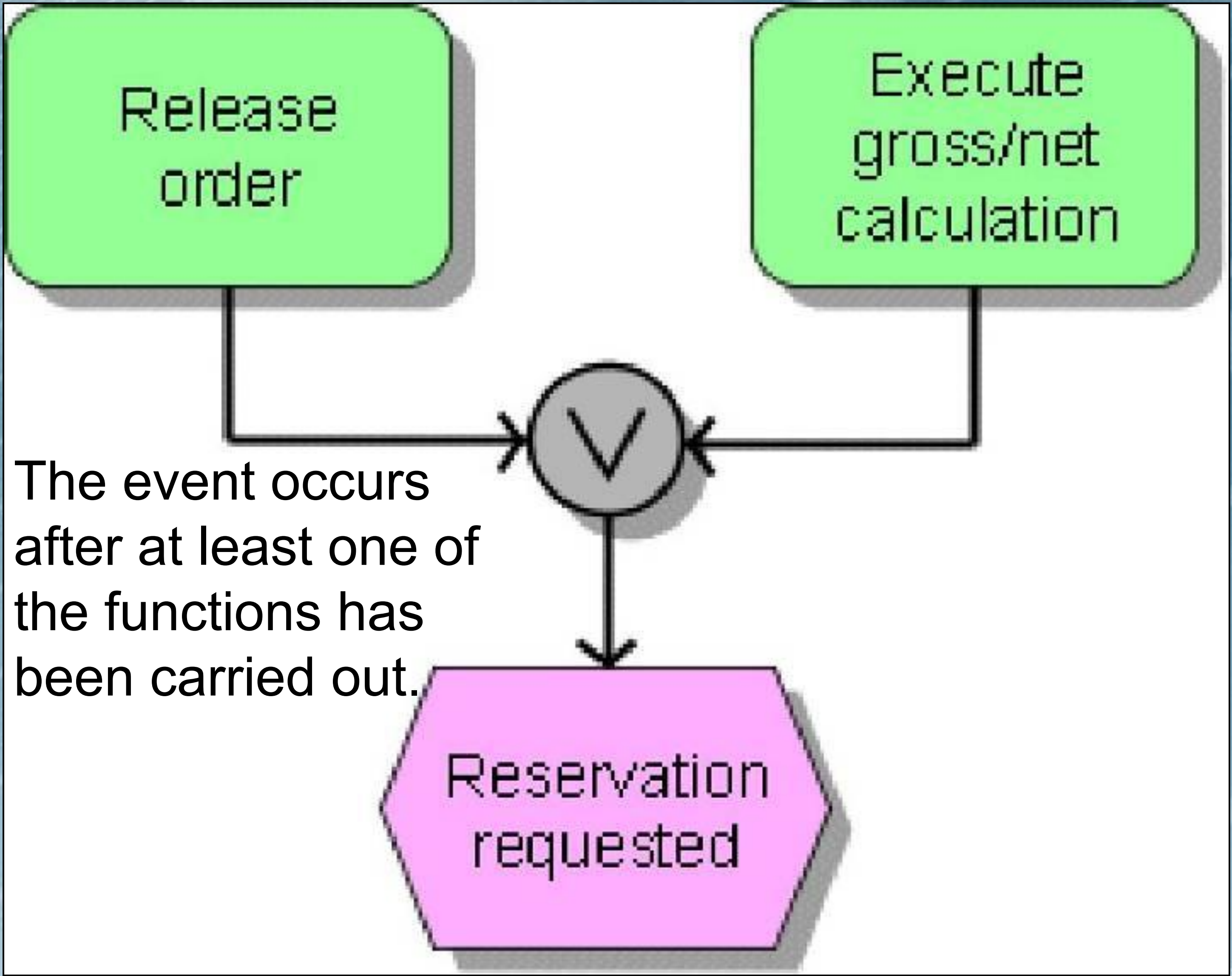


AND OPERATOR OF FUNCTIONS WITH CREATED EVENTS



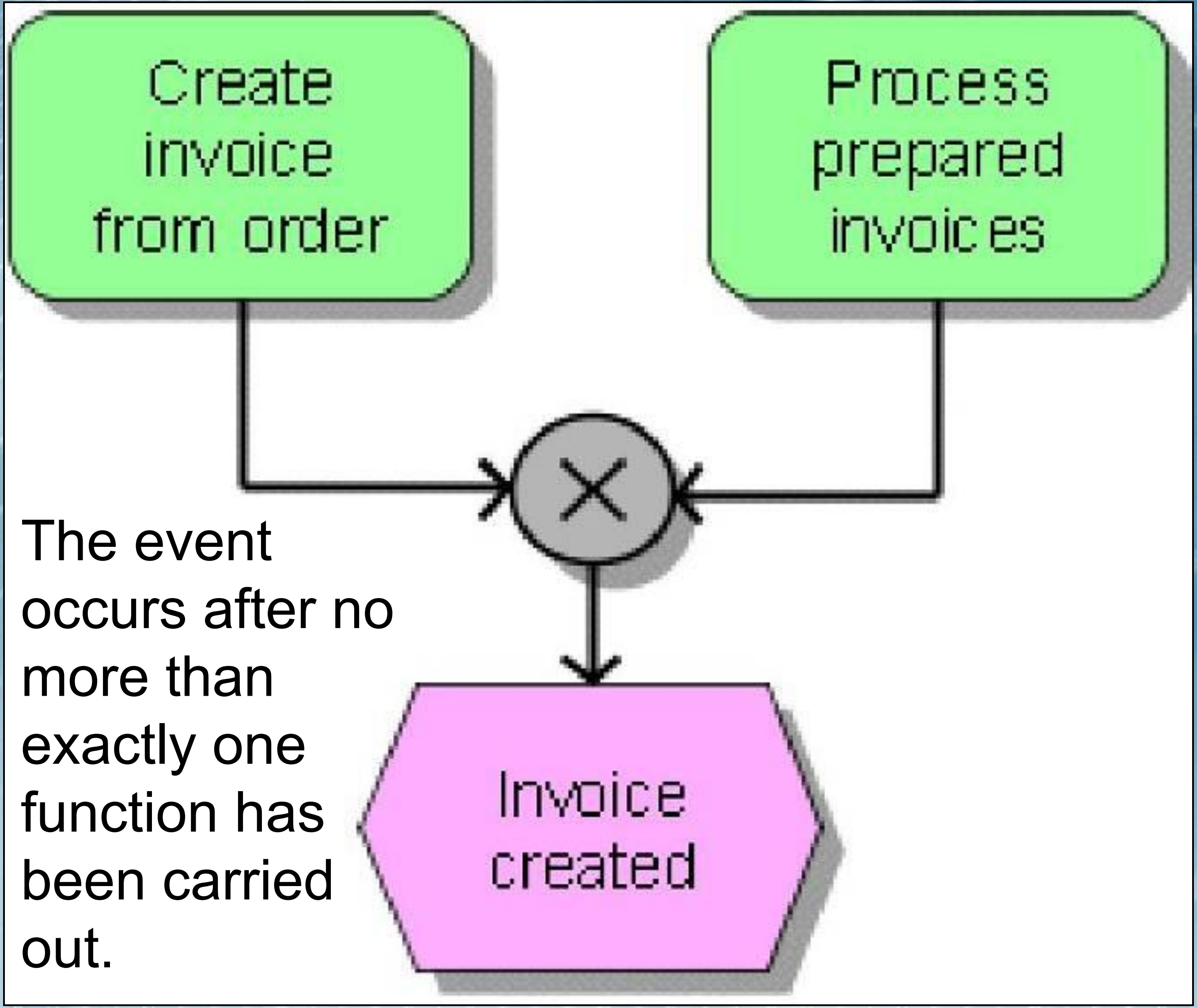
The event occurs only after all functions have been carried out.

OR OPERATOR OF FUNCTIONS WITH CREATED EVENTS



The event occurs after at least one of the functions has been carried out.

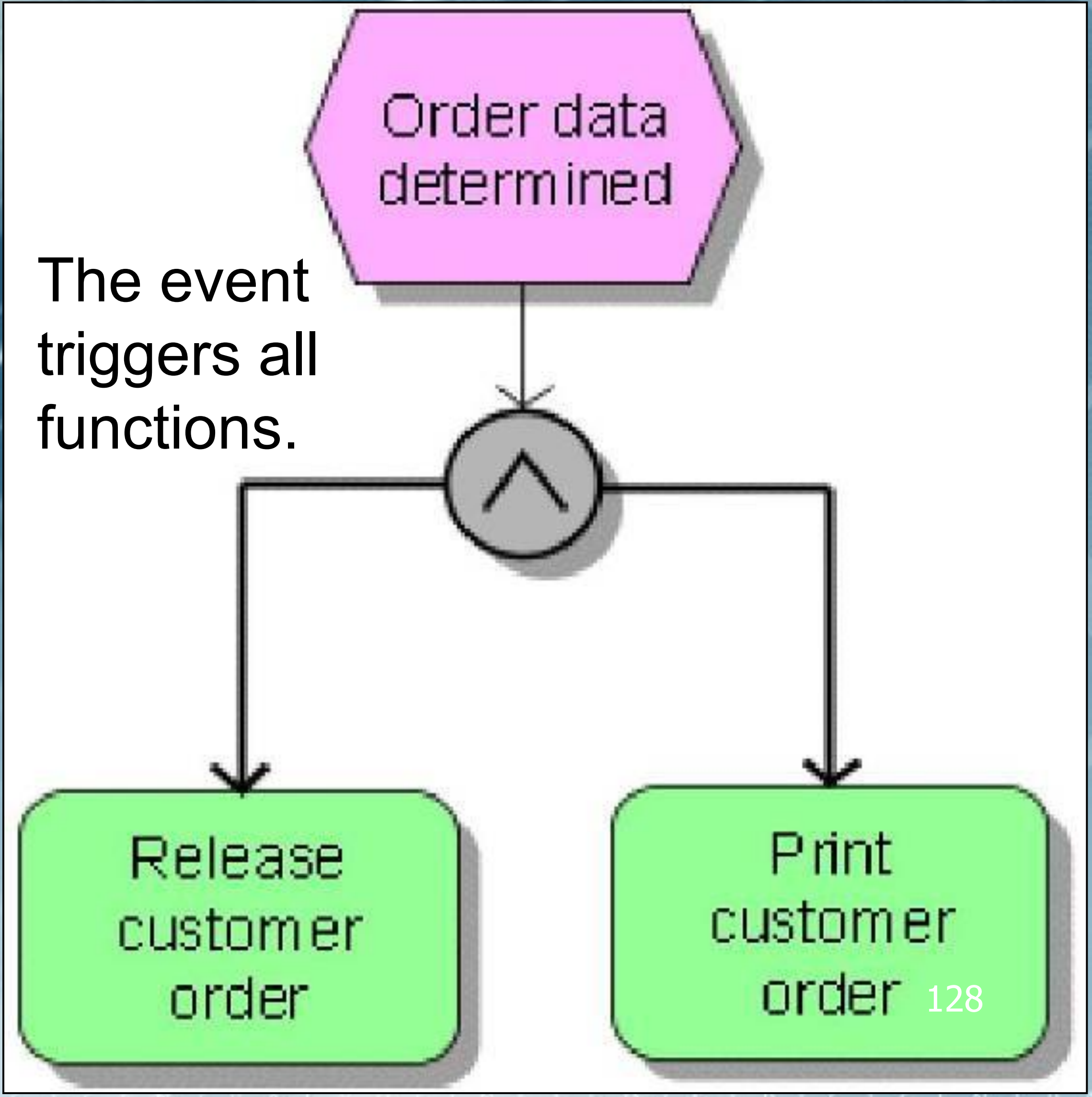
EXLUSIVE OR (XOR) OPERATOR OF FUNCTIONS WITH CREATED EVENTS



The event occurs after no more than exactly one function has been carried out.

AND OPERATOR OF FUNCTIONS WITH TRIGGERING EVENTS

OR
&
Exclusive OR (XOR)
are invalid because
events have no
decision-making power.



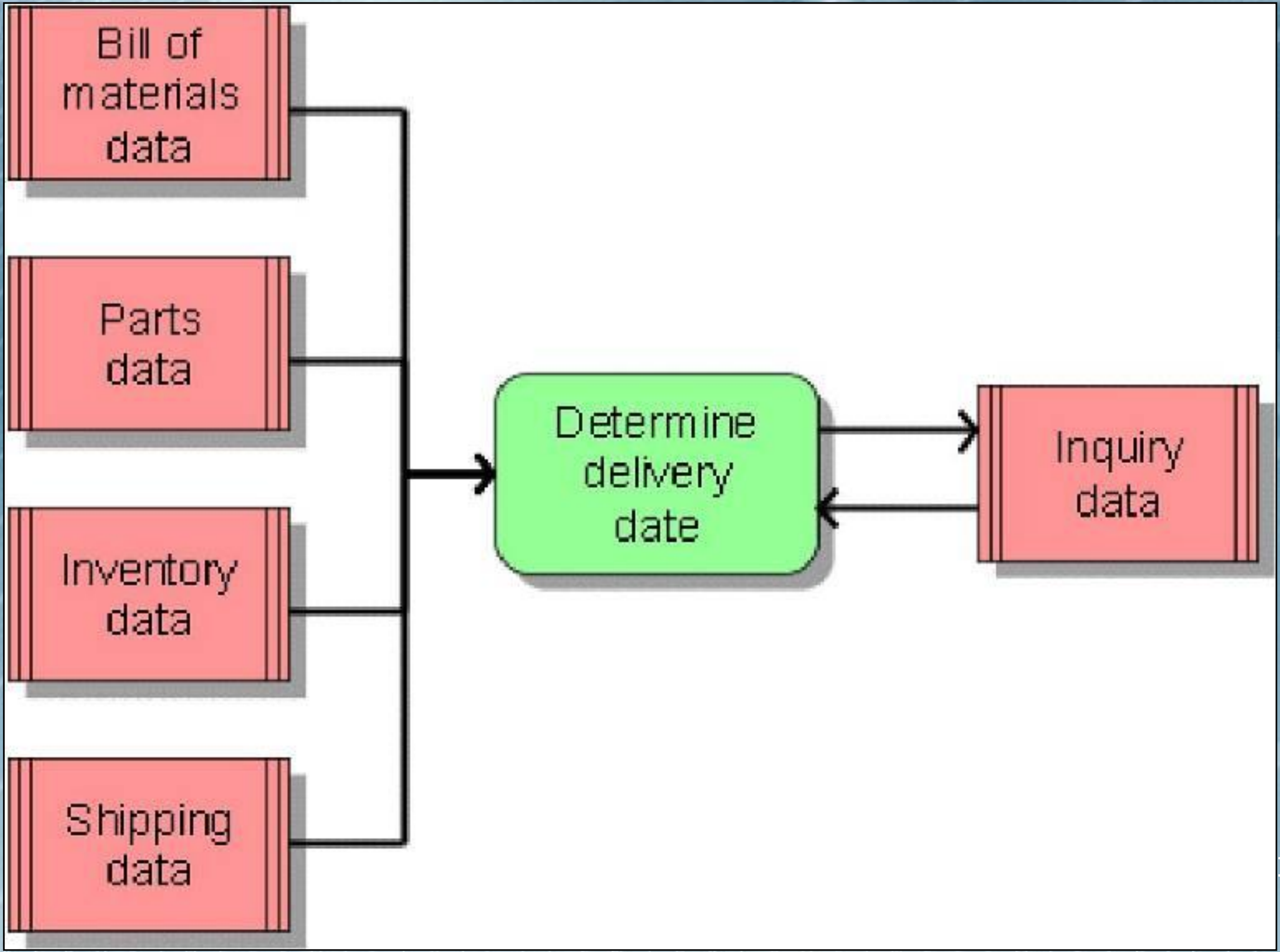
The event triggers all functions.

FUNCTION ALLOCATION DIAGRAM (I/O)

In addition to the event control representation the transformation of input data into output data and the representation of data flows between functions also form a link between the data view and the function view in the ARIS concept. The transformation of input data into output data can be illustrated in Function allocation diagrams (I/O) which basically correspond to pure input/output diagrams used in other methods.

A function allocation diagram (I/O) consists of functions of the function view and information objects of the data view. The arrows determine whether an information object is used only as input data, output data, or as input/output data. More detailed specifications are possible, indicating, for example, that the function has created or deleted an information object. Depending on the degree of detail, information objects can be data clusters, entity or relationship types, or attributes of the data view.

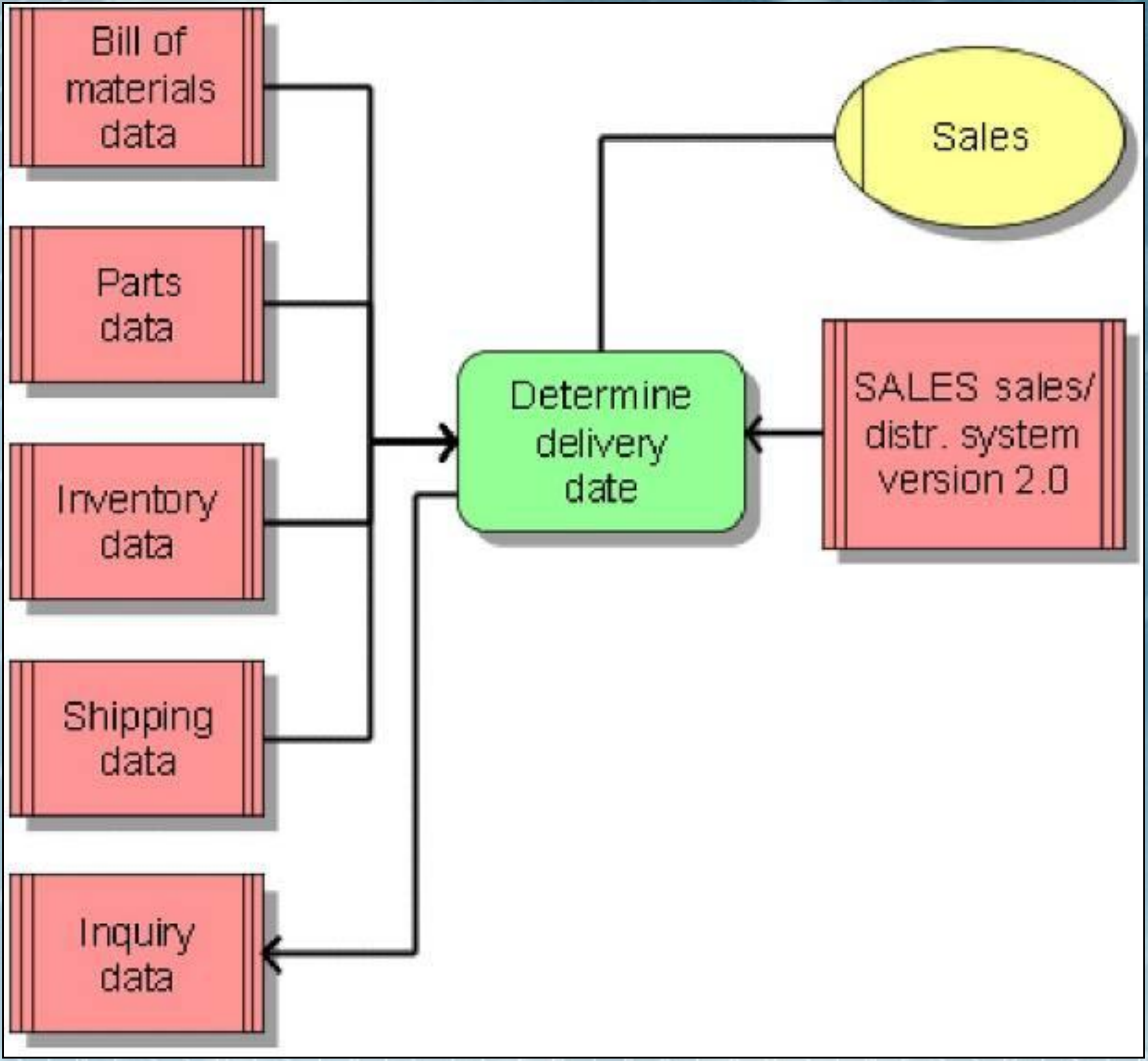
EXAMPLE OF FUNCTION ALLOCATION DIAGRAM (I/O)



FUNCTION ALLOCATION DIAGRAM (I/O)

Besides a function's input/output data, events and all other objects that can be allocated to the functions in an EPC are available. Thus, the user is able to restrict the modeling of process chains in EPC diagrams to events and functions, and to assign each function a function allocation diagram (I/O) containing all additional relationships the function has. This allows for much clearer representations of business processes and also explains the use of a new name for this model type. The following figure illustrates an example of this more detailed representation in a function allocation diagram.

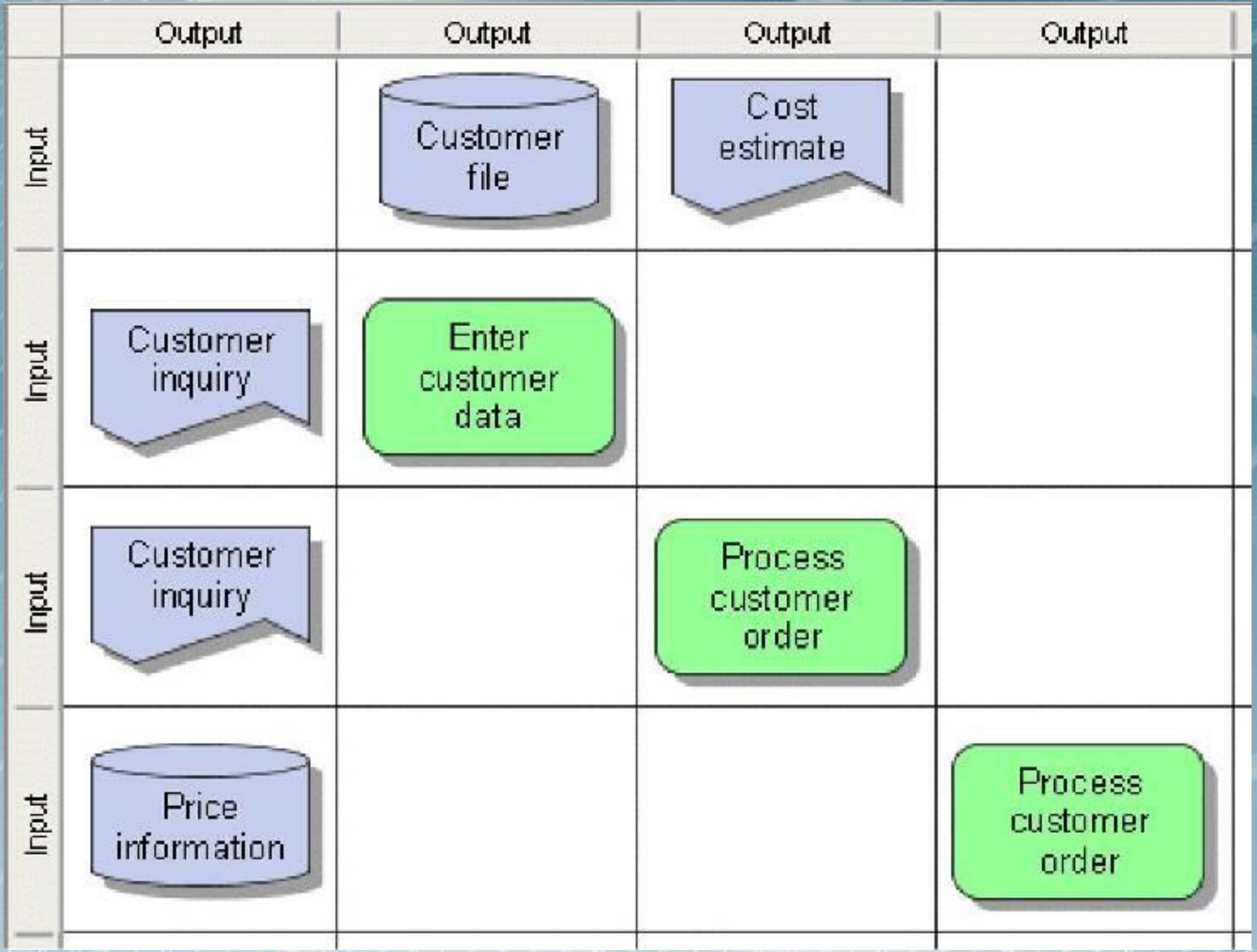
DETAILED REPRESENTATION OF THE FUNCTION ALLOCATION DIAGRAM



EPC WITH INPUT/OUTPUT DATA

Besides this method of representing data transformation in the form of function allocation diagrams (I/O), it is also possible to include this information in an EPC. The following figure illustrates an example. In this case, the links between functions and information objects play the same role as in function allocation diagrams (I/O). However, including them in a process chain having numerous branches may result in a very complex representation.

EPC WITH INPUT/OUTPUT DATA

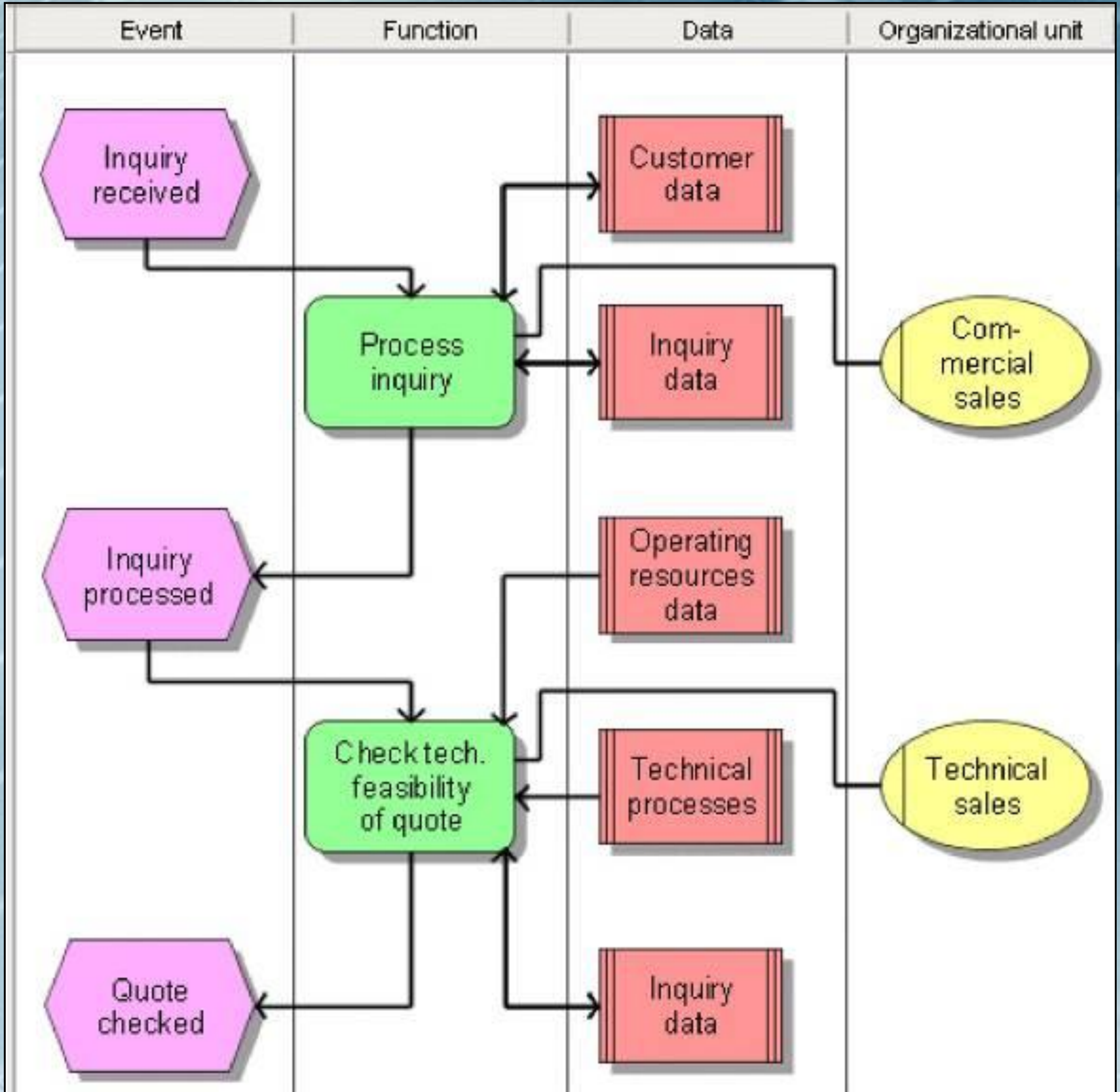


	Output	Output	Output	Output
Input		Customer file	Cost estimate	
Input	Customer inquiry	Enter customer data		
Input	Customer inquiry		Process customer order	
Input	Price information			Process customer order

EPC WITH INPUT/OUTPUT DATA

In the PCD (process chain diagram), objects have to be arranged according to the column description. The EPC representation permits free object arrangement. However, adding input/output data may result in complex and thus confusing models.

EPC WITH INPUT/OUTPUT DATA



INDUSTRIAL PROCESS & OFFICE PROCESS

The Industrial process and Office process model types essentially represent the same facts as the EPC model type, with the difference that they provide only a limited selection of objects and the symbols are represented in graphical form.

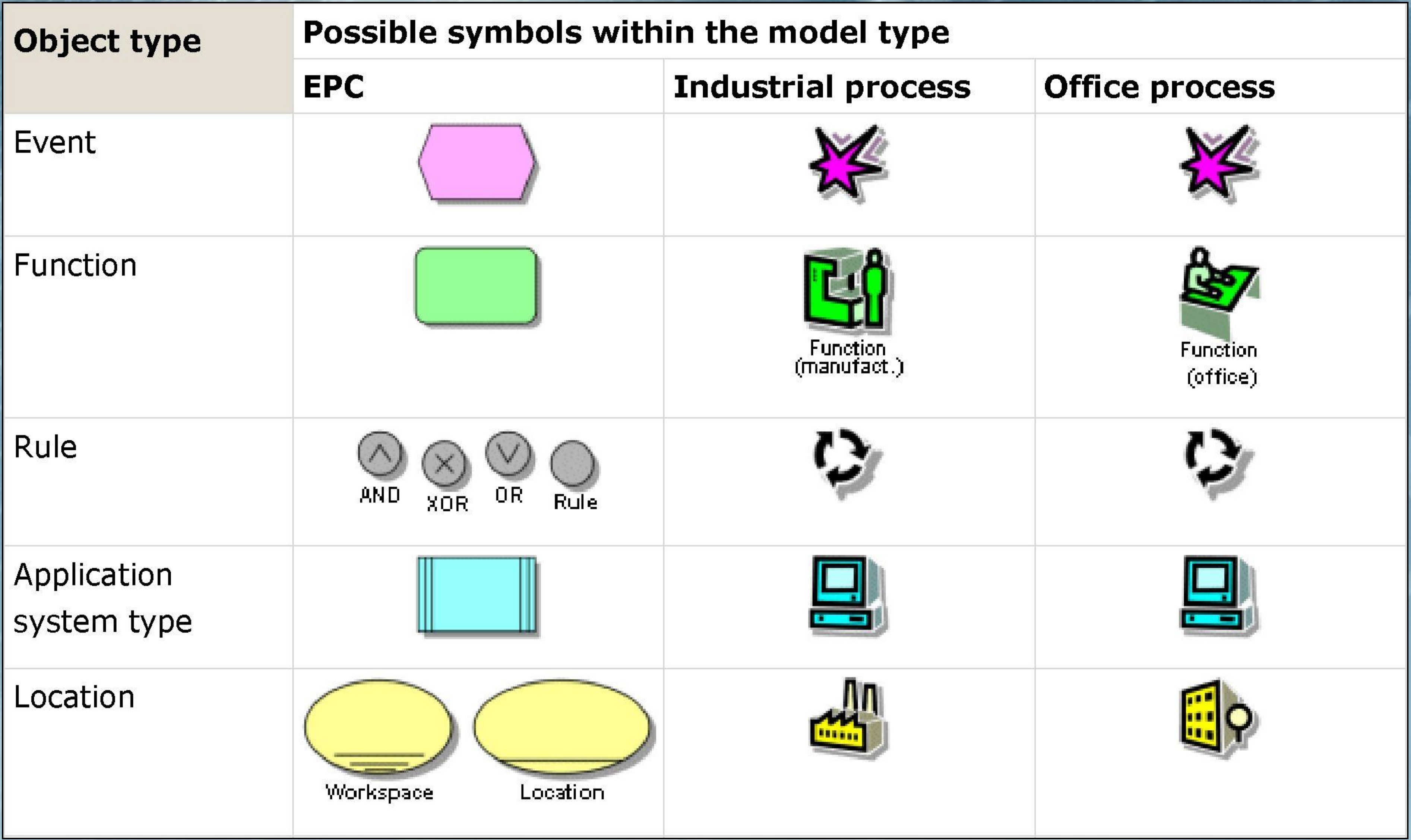
This kind of graphical representation has the advantage that employees in the operating departments can understand the models without training and are able to adjust and develop them themselves. For instance, it is easy for every user to see that a symbol showing three persons represents a group, whereas this is not as obvious in the abstract EPC symbolism (oval with double frame). Therefore, the goal of these two model types is to establish process modeling, process optimization, and process utilization in the operating departments.

INDUSTRIAL PROCESS & OFFICE PROCESS

To maximize the identification with symbols, two process types (model types) are provided:

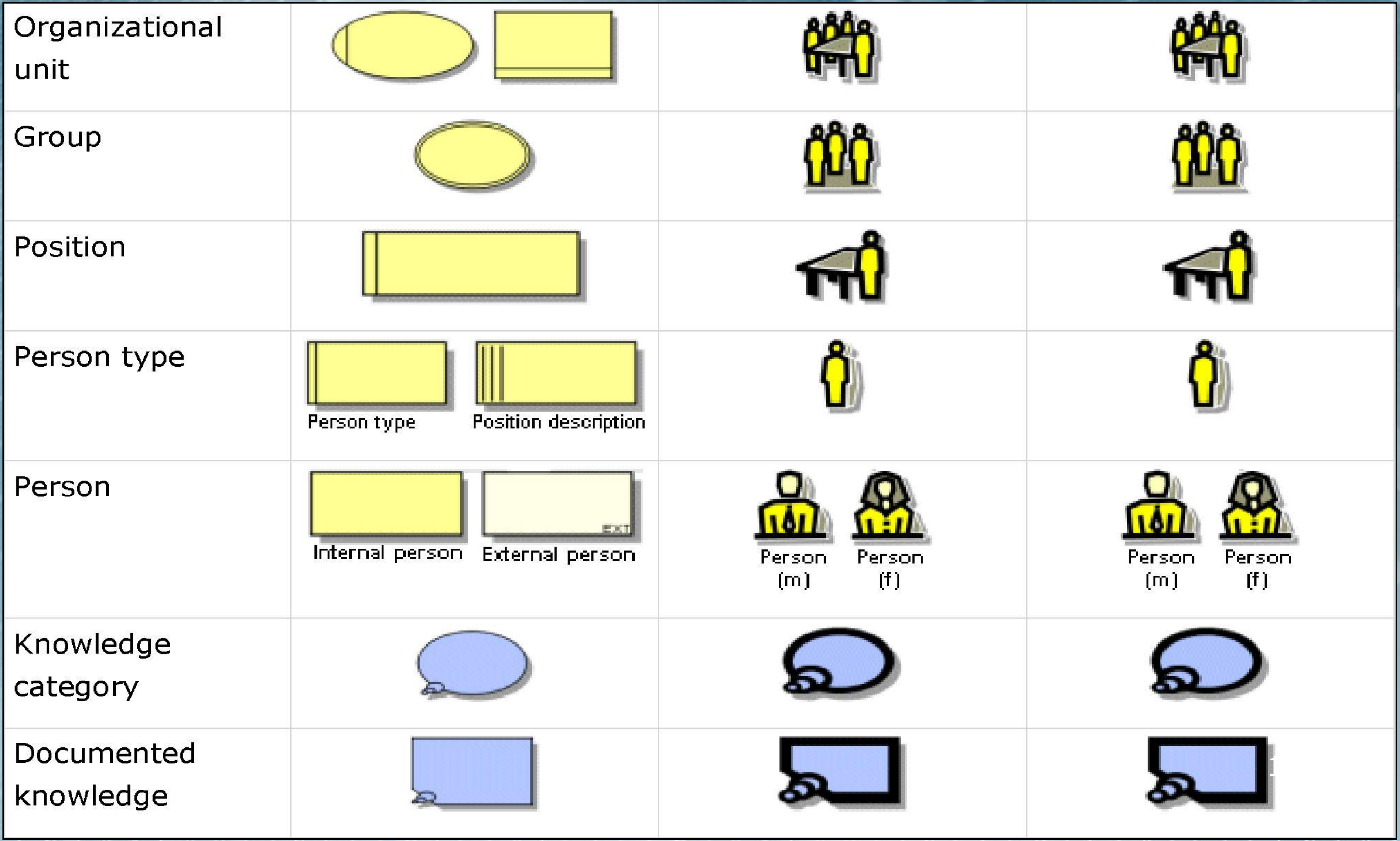
- ✔ the “Industrial process” illustrates production processes (which create material goods/products)
- ✔ the “Office process” illustrates office processes (which create intangible goods/services).

INDUSTRIAL PROCESS & OFFICE PROCESS



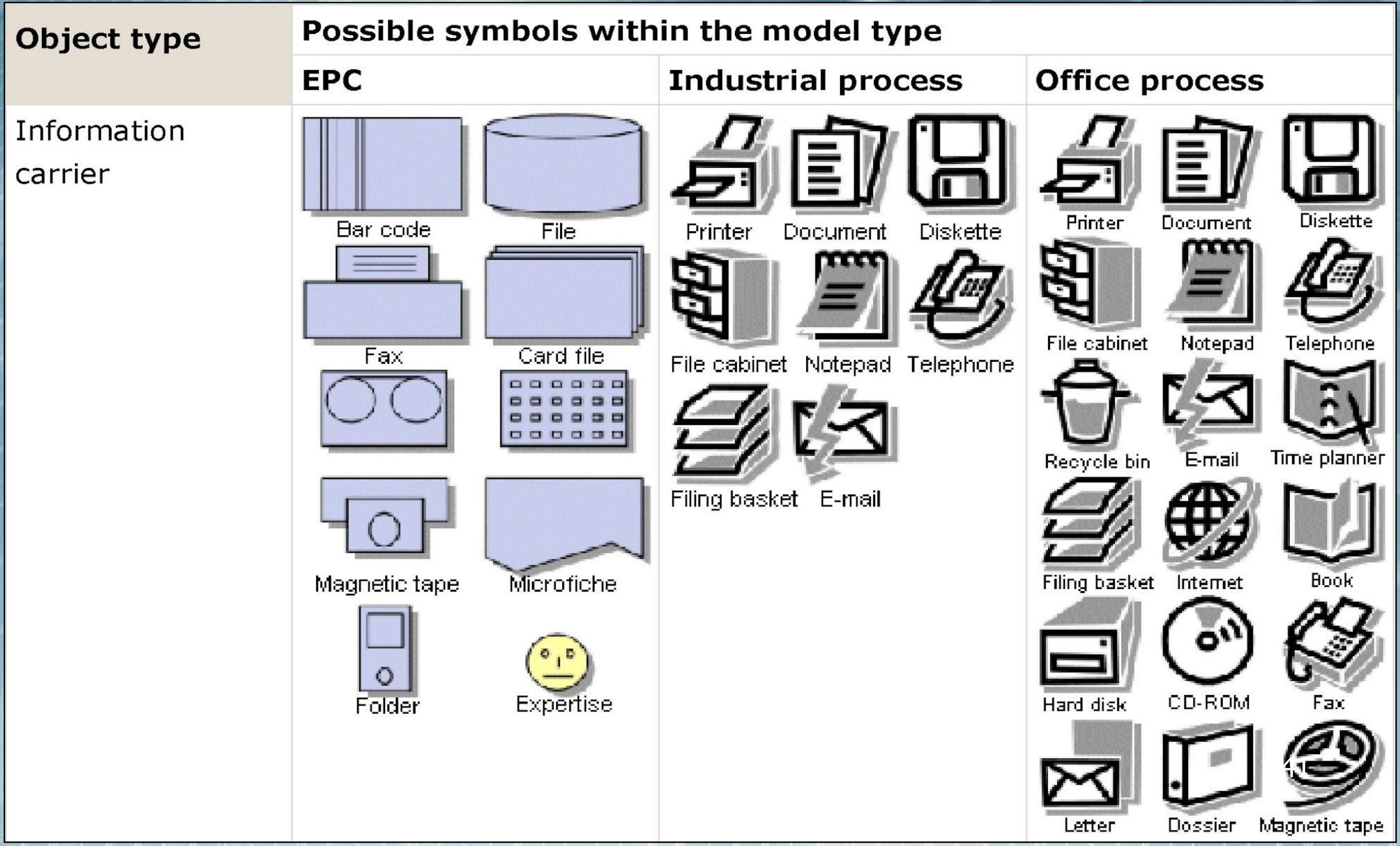
Object type	Possible symbols within the model type		
	EPC	Industrial process	Office process
Event			
Function		Function (manufact.)	Function (office)
Rule	AND XOR OR Rule		
Application system type			
Location	Workspace Location		

INDUSTRIAL PROCESS & OFFICE PROCESS



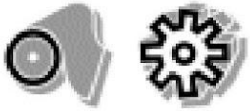
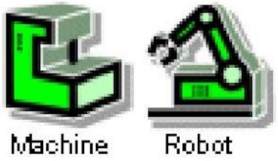
Organizational unit			
Group			
Position			
Person type	Person type Position description		
Person	Internal person External person	Person (m) Person (f)	Person (m) Person (f)
Knowledge category			
Documented knowledge			

INDUSTRIAL PROCESS & OFFICE PROCESS

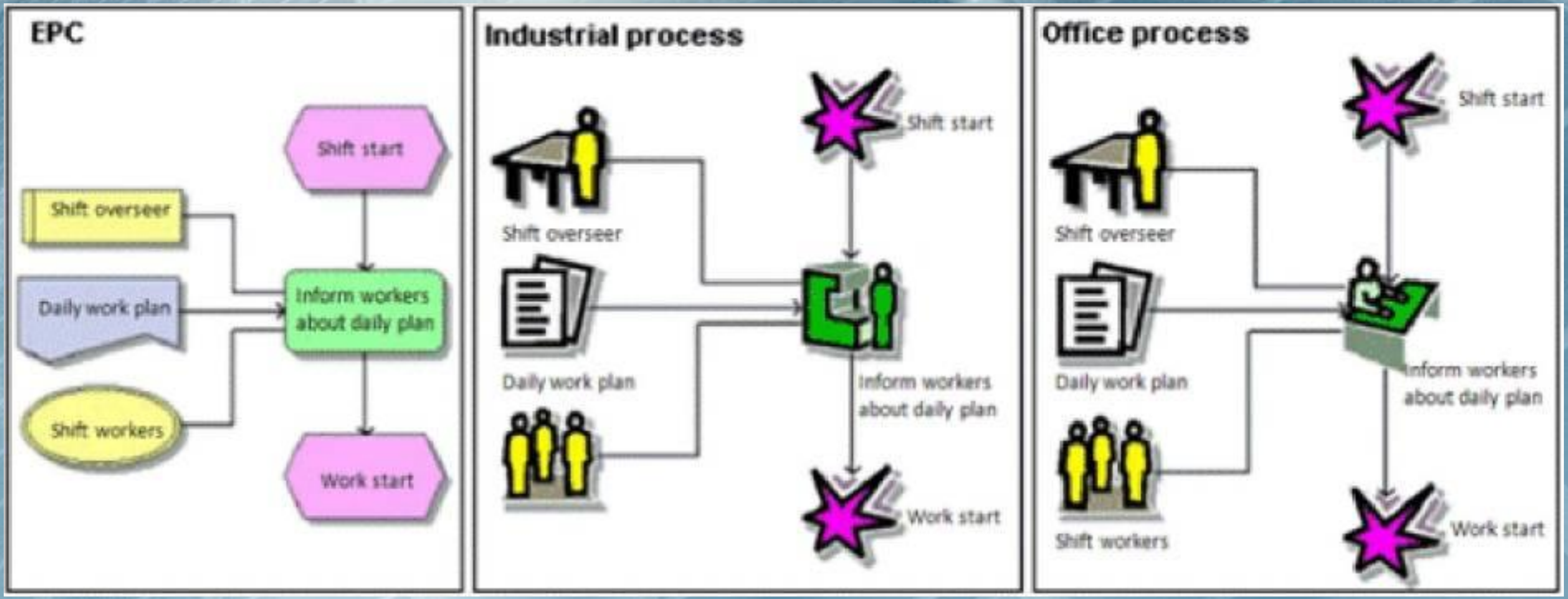


Object type	Possible symbols within the model type		
	EPC	Industrial process	Office process
Information carrier	Bar code File Fax Card file Magnetic tape Microfiche Folder Expertise	Printer Document Diskette File cabinet Notepad Telephone Filing basket E-mail	Printer Document Diskette File cabinet Notepad Telephone Recycle bin E-mail Time planner Filing basket Internet Book Hard disk CD-ROM Fax Letter Dossier Magnetic tape

INDUSTRIAL PROCESS & OFFICE PROCESS

Material type	🟩		-
Transport system type	🟩		-
Operating resource type	🟩		-
Technical operating supply type	🟩		-
Packaging material type	□		-
Warehouse equipment type	🟩		-

EXAMPLES OF EPC, INDUSTRIAL PROCESS & OFFICE PROCESS


EPC
Shift start
Shift overseer
Daily work plan
Inform workers about daily plan
Shift workers
Work start
Industrial process
Shift start
Shift overseer
Daily work plan
Inform workers about daily plan
Work start
Office process
Shift start
Shift overseer
Daily work plan
Inform workers about daily plan
Shift workers
Work start