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Postal services — Customer-directed information including track and trace — General concepts and definitions

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National foreword

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Postalische Dienstleistungen - Kundengesteuerte Informationen einschließlich track-and-trace - Allgemeine Konzepte und Definitionen

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Foreword

This document (CEN/TR 15524:2011) has been prepared by Technical Committee CEN/TC 331 “Postal Services”, the secretariat of which is held by NEN.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes CEN/TR 15524:2006.

Introduction

Widespread proliferation of electronic, internet-based data communications provides a cost-effective platform for the effective integration of a global mail communication system. The essence of such integration is an automated exchange of computerised information between *mailer, postal and recipient domains*. Within each of these domains there is a wealth of information that has been, or could be collected, computerised and subsequently communicated to other domains, enhancing the overall mail system. This information is typically information *about* mail units and it allows for effective control and management of the entire mail distribution network and integration of mail communications with main business applications in postal customers IT systems. In particular, modern postal operators employ sophisticated mail processing machinery and supporting IT infrastructure. Computerised information describing mail units and sets undergoing postal processing, transportation and delivery activities that already exists within postal IT systems does have significant value for postal customers, both senders and recipients (and their authorised agents). The main purpose of the present Technical Report is to define basic concepts associated with collection and distribution of post-generated information to postal customers (framed using methodology of an entity-relationship model), and to describe the content and structure of messages that can be used by posts to communicate this information to its customers using post-mailer interface. This report, however, does not describe specific messages and protocols that could be recommended for communicating the collected information nor the methods of its use within sender or recipient environments.

Thus, the main objective of this document is a description of a standardised method of capturing by post and enabling customers to access information within the *postal environment*. The basis of the method described in this report is an entity–relationship model that is widely used in the design of modern computer databases. At the heart of this model is the notion of *mail units and their attributes,* the values of which can be captured at feasible and desirable locations and dates to form *observations*. Comparison of observations taken at different locations and dates naturally leads to the notion of *events* that are triggers for the communication of information contained in the observations to postal customers. Generalisation of the concept of observation is the concept of *expectation* that provides quite a useful way to create a forecast for the future values of mail units attributes. Together, expectations, observations and values of mail unit attributes form a basis for a formal and broad definition of the concept of *postal product or service*. It is expected that more and more postal services will be information-rich, meaning that the main added value of such services will come from computerised information (about postal distribution process applied to mail units) that will be made available to postal customers.

The methodology described in this report is also applicable to capturing a broad class of information that is encountered in mail communication systems, for example information that is important for managing data exchanges between postal operators and between postal operators and their contractors.

1 Scope

This Technical Report consists of three parts.

The first part defines, describes and explains basic concepts typical to all mail communication systems such as; domains, parties, agents and their role in the system, physical and informational objects, processes, interfaces and relationships.

The first part does not cover more detailed technical aspects of the main concepts such as:

— a detailed description of mail units and sets, their attributes and methods of collection/capture of their values;

— applications describing specific use of the information describing basic objects by mailers, postal operators and recipients;

— data elements, data constructs and message descriptions;

— communication protocols and infrastructure for message transport including transport of messages through a print-scan channel (or paper channel);

— message security issues related to individual messages: confidentiality and integrity of data, authentication and non-repudiation;

— printing symbology, physical placement of data elements and symbols, their orientation and dimensions, and inks and print quality.

The second part of this Technical Report defines the necessary and sufficient concepts for customer directed information that can be captured by post and made accessible to customers using post-mailer interface. This report explains and describes relationships between these concepts.

This report provides a comprehensive list of mail unit attributes that are involved in forming observations and events significant for postal customers. This report describes a methodology suitable for the selection of observation points within postal domain process where information collected in observations is most useful for customers. The report does not cover:

— applications describing the use of collected event information;

— messages and protocols;

— communication infrastructure.

The third part of this Technical Report describes:

— a list of specific events knowledge of which is valuable to postal customers (mail senders and recipients) and could be made available to such customers;

— underlying mail unit attributes that form corresponding observations;

— data construct supporting practical access to information collected within postal domain about events, underlying observations and expectations, and in particular information about events, observations and expectations that are valuable to postal customers.

This Technical Report also provides an example of application that demonstrates the use of specific events and data constructs.

This Technical Report makes use of XML schema in describing relevant data constructs. Actual communication messages can be built from data constructs described in this report. However, this report does not specify the structure of specific messages, nor does it preclude using mechanisms other than XML schema to describe data constructs.

2 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

2.1
address list selection
process of selecting a mailing address for the intended recipient of the message

2.2
agent
entity involved in any part of the provision of postal services in respect of a mail item

2.3
agent attribute
characteristic of the agent which is or can be represented by a data value

2.4
authorised third party
party that is authorised by the mail originator to receive information about the mail unit for the purpose of potential dispute resolution concerning the mail unit between the mail originator, postal operator, carrier or their agents and the recipient

2.5
collection (posting)
process of picking up mail units from collection boxes, postal retail facilities or the mailer domain

2.6
communication domain
domain
set of parties, agents, and processes that together play a specific functional role (such as sender, channel or recipient) in a mail communication system

2.7
consolidator
party that is responsible for assembling mail units from a given creator together with mail units from other creators

2.8
containerisation
process of assembling together and putting mail units into receptacles for transportation

2.9
mail creator
creator
party that is responsible for production (creation) of a mail item, a mail unit or an aggregate

2.10
customs process
series of activities comprising customs entry, customs examination, clearance, retention or refusal aimed at processing dutiable cross-border mail units according to customs regulations

2.11
delivery
process of transferring a mail unit from a postal operator/carrier to a recipient which may result in successful completion or failure

2.12
destination postal operator/carrier
party responsible for accepting a mail unit from other postal operator/carrier or its contractor and for processing and delivery of the mail unit to its final destination (a recipient or recipients)

2.13
electronically exchanged message
EEM
electronic message sent or received by a mailer or postal operator during the process of mail creation, preparation, submission, acceptance, processing and delivery

2.14
electronic interface channel
electronic communication channel designed for the exchange of information between computers operating in mailer, postal and recipient domains and enabled by a public or private electronic communication network such as internet

2.15
electronic sortation
process of sorting a list of mailing addresses into groups having common characteristics (such as identical postal codes)

2.16
event
occurrence of a significant change in the actual or predicted values of one or more attributes of an entity

2.17
event attribute
set of name-value pairs specifying a significant change(s) or a deviation(s) that trigger the event, the name and/or identities of the parties responsible for defining these values and the rules governing the decision concerning the occurrence of the event

2.18
expectation
set of mail unit attribute name-value pairs predicted, derived or assumed for a given date or a date range

2.19
facility entry
process of entering mail units into postal/carrier processing facilities

2.20
finishing
process of direct printing of information on (or applying labels containing information to) assembled mail units, said information concerning payment evidence and endorsements required for the entry of finished mail units into the postal distribution network

2.21
incoming sortation
process of sorting mail units into groups having common internal characteristics such as recipient mail stop codes or recipient names

2.22
insertion
process of folding printed message(s), assembling the content (that includes the message and optional additional enclosures) and inserting the entire content into a mailing envelope

2.23
intended recipient
party that is specified in the destination address of the mail unit or otherwise uniquely identified by its originator

2.24
list preparation (address cleansing)
process of comparing between mailing (postal) addresses in the selected address list and a standardised list containing corrected and up-to-date postal addresses for the purpose of finding and correcting erroneous entries in the selected list

2.25
mail aggregate
aggregate
set of mail units that satisfy specific criteria defined in the context of a particular application

2.26
aggregate attribute
characteristic of a mail aggregate which is or can be represented by a data value

2.27
aggregate catalogue
set of all attribute names of a mail aggregate

2.28
mail unit
mail item or collection of mail items which are constrained to form a physical unit

2.29
mail unit processing
collection of sequential activities such as culling, facing, cancelling, sortation, printing of ID tags, application of forwarding labels and containerisation that are performed in postal/carrier processing facilities before mail units are transferred for loading and transportation

2.30
mail unit attribute
characteristic of a mail unit which is or can be represented by a data value

NOTE Mail unit attributes could be a single value, a set of values including a simple range of values or a value that is expressed as a complement to a given set of values. This means that the fact that a given mail unit does not have a specified value can also be expressed using the concept of mail unit attribute (in this manner, for example, the values “not within the given range” can be also expressed).

2.31
mail induction/entry
process whereby mail units are handed over to a postal operator and which results in either the postal operator taking responsibility for the mail units concerned or rejecting all or some of the mail units presented for hand-over

2.32
mail item
item
mail piece
postal item
indivisible mailable entity in respect of which a mail service contractor accepts an obligation to provide postal services

2.33
mail item content
physical document or documents and/or an object contained within means of closure such as an envelope, a box, a wrapper, and intended for the use of the recipient; all objects included in a mail item

2.34
mail receptacle
physical device which may be used to contain or carry mail so as to assist in its handling, transportation, storage or delivery as a unit

EXAMPLE Mailbags, trays, recipient mailbox, wheeled containers (roller cages), pallet and pallet-based containers and airfreight containers (ULDs).

NOTE Receptacles may contain mail which is housed in other (lower level) receptacles. For example, a roller cage may contain trays and/or bags of mail as well as individual (loose loaded) mail items and bundles. Some types of postal receptacle (e.g. roller cages and ULDs) have a residual value; others need not (e.g. disposable trays).

2.35
mail receptacle attribute
characteristic of a mail receptacle which is or can be represented by a data value

2.36
mailing submission
mail aggregate which has a unique identification and is presented or handed over for processing, by a postal operator, as part of a single induction unit

2.37
material interface channel
physical communication channel designed for the exchange of information between computers operating in mailer, postal and recipient domains by printing or attaching electronically stored digital information to a mail unit and optically or electronically scanning (capturing) information present on this entity

2.38
message preparation
process of preparing data that is designed to be sent as a message (content of a mail item) to the intended recipient

2.39
observation
set of mail unit attribute name-value pairs captured at a given date

2.40
observation attribute
set of name-value pairs related to or characterising the observation process

2.41
opening and processing
process of mail unit opening, extracting its content (message) and processing information (or object) contained therein

2.42
originating postal operator/carrier
party responsible for the acceptance of a mail unit or an aggregate from the mail entity/aggregate submitter into a postal distribution network and possibly for transfer of the mail unit/aggregate to another party for processing and delivery

2.43
originator
party that controls a mail unit's content (i.e. the message to the recipient) and the mail unit's destination address and has the overall legal control and responsibility for the mail unit

2.44
party
legal entity involved in a mail communication process

2.45
party attribute
characteristic of the party which is or can be represented by a data value

2.46
payer
party responsible for payment of charges for services rendered by a mail service contractor in respect of a mail item

2.47
physical sortation
process of sorting mail units into groups having common characteristics (such as identical postal codes)

2.48
postal product/service
agreed-upon set of rules operating on the values of mail unit attributes governing both actions to be taken on the mail unit and communication of observations to all authorised parties

2.49
postal product/service attribute
set of name-value pairs related to or characterising a postal product

2.50
post/carrier domain
domain of the mail unit collection, acceptance, processing, transportation and delivery that includes all parties, agents, processes and their relationships that are involved in these activities

2.51
process in the mailer domain
series of sequential functional activities (or sub-processes) within the mailer domain resulting in a finished mail item, a mail unit or an aggregate being ready for entry into a postal/carrier distribution network

2.52
process in the postal domain
series of sequential functional activities (or sub-processes) within the postal domain including collection, facility entry, acceptance, processing (culling, facing, sorting), containerisation and transportation resulting in a mail unit being delivered to a recipient, discarded or returned to the mail originator (or a party authorised by the mail originator)

2.53
process in the recipient domain
series of sequential functional activities (or sub-processes) within the recipient's domain resulting in a mail unit being delivered to a recipient, discarded or returned to the postal domain for exception processing

2.54
recipient domain
domain of the mail unit receipt and after receipt processing including activities when the mail unit has been received by a party or an agent other than the party specifically indicated by the sender as a recipient. It includes all parties, agents, processes and their relationships that are involved in these activities

2.55
return
process of returning a mail unit to the postal operator for the purpose of sending it back to the mail unit's originator or its agent

2.56
sender/mailer domain
domain of the mail unit creation, finishing and submission for delivery that includes all parties, agents, processes and their relationships that are involved in these activities

2.57
statement of aggregate
collection of attribute name-value pairs for an aggregate assembled for the purpose of a specific application in the context of which mail units comprising the aggregate form a logical unit

2.58
statement of mailing submission
collection of attribute name-value pairs which specifies a mailing submission and its content

2.59
submitter
party responsible for submitting (inducting) a mail unit or an aggregate into postal/carrier distribution network

2.60
transportation
process of carrying mail units (or mail aggregates) from one location to another that can involve carrier reception, transport vehicle assignment, loading, unloading and carrier hand-over

2.61
transportation contractor
party responsible for transporting a mail unit received from a postal operator or a carrier from one location to another

2.62
undesirable recipient
party that has obtained the mail unit as a result of illegal or unauthorised activity such as mail theft

2.63
unintended recipient
party that has obtained the mail unit as a result of an inadvertent error that has occurred within the mail communication system such as delivery to a wrong address or a wrong recipient

3 Symbols and Abbreviations

AOI area of interest

DAB destination address block

DPM digital postage mark

ID (identifier for) identity

MU mail unit

MS mailing submission

MS-ID mailing submission identifier

NULL the value of an attribute meaning, by convention, that there are no known values

OCR optical character recognition

PP postal product

PP-ID postal product identifier

RFID radio-frequency identification

NOTE Throughout the document, the following notation is used "entity.attribute". For example, the mail unit identifier is designated as “mailunit.mailunit.ID”.

4 General concepts

This clause provides the background, motivation and explanation for all concepts and objects that are defined in Clause 2. General concepts are described referring to a mail communication system diagram presented in Figure 1.

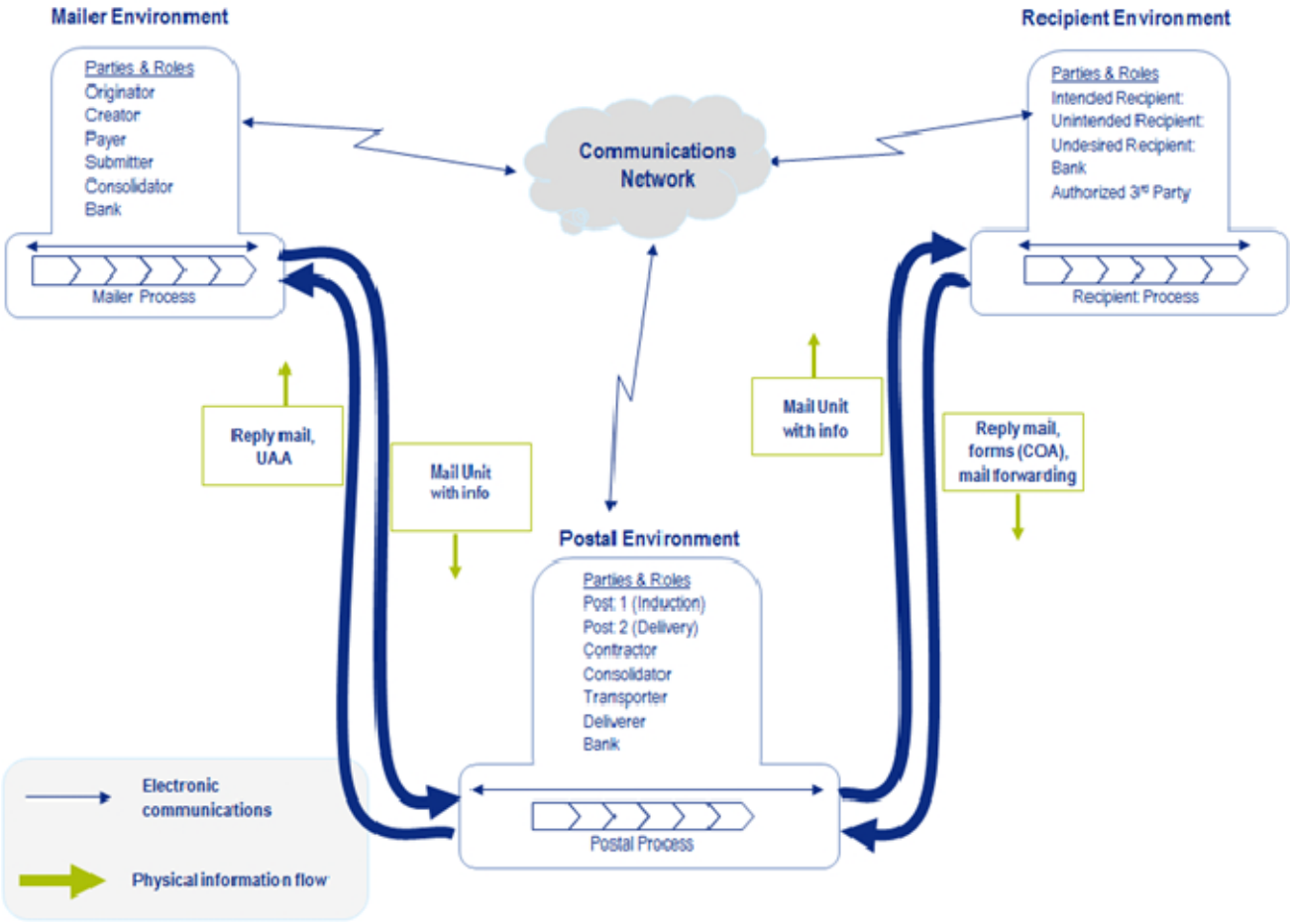

Figure 1 – Mail communication system diagram

4.1 Mail communication system domains

The communication system is a system that enables a *sender* to send (communicate) a *message* to a *recipient* using a *communication channel*. A mail communication system has three basic domains, namely the domain of the message sender, the domain of the message carrier (the communication channel) and the domain of the message recipient. In the context of a mail communication system, a *message* constitutes a *physical entity* (defined in the present document as the mail unit) and as such, it is understood to constitute a single physical object (mail item) or to include a broad variety of physical objects such as post cards, letters, flats, parcels or packages constrained to form a physical unit. Specific to the mail communication system is the notion that messages frequently have value other than informational value, for example monetary, legal or social value.

There are three commonly considered domains, namely Sender/Mailer, Post/Carrier and Recipient. Each domain can be described in terms of parties, agents, processes and their relationships. In the mail communication system, parties involved in each domain are usually independent legal entities that are nevertheless dependent on each other in the overall system process that involves creation and exchange of material (*mail units*) and informational objects (*mail unit attributes, observations, expectations and their attributes*) between domains.

4.2 Parties, agents and their roles

Parties involved in mail unit creation, finishing and submission for delivery are:

— originator;

— creator;

— payer;

— submitter;

— consolidator;

— bank (or other financial service institution involved in payment for mail unit creation, finishing and distribution).

The originator is understood as the party that has a need to use the mail communication system to send mail units to (a list of) addresses that are chosen by the originator. The originator is also the primary beneficiary of communication. In the context of business applications involving mail communications the originator also controls these applications, for example invoicing or product advertising.

The creator is understood as the party that controls physical process of mail unit creation, typically under a contract with the mail originator (for example when the mail creator and originators are different legal entities).

The payer is defined as the party that pays for postal products and services and frequently the originator and the payer are the same legal entity.

The submitter performs a technical role of submitting a mail unit or a set for induction into the mail distribution network, while a consolidator combines mail units from multiple mail creators in order to achieve certain desirable characteristics for resulting mail unit or an aggregate. The most frequent reason and purpose for consolidation is value added by pre-sort or other work sharing activites. In the vast majority of cases the consolidator also assumes the role of the submitter.

Finally, the bank (which is used here synonymously with a financial institution) is capable of providing necessary credit and fund transfer functions.

Modern mail communication systems involve computer-controlled electro-mechanical machinery (e.g. sorting machines), transportation (e.g. delivery vehicles) and computer equipment (e.g. IT systems) and human participants (e.g. post office clerks). Mail processing machines, equipment and human participants are designated as agents. Agents involved in mail unit creation, finishing and submission for delivery are various automated, semi-automated and manual systems and their operators such as; inserters (mail assembly machines), mailing machines, franking devices, mail sorters, containerisation systems, computerised accounting devices (also known as postal security devices or PSDs) and scanning devices. For example, mail-sorting machines typically organise letters or flats into groups of mail items having identical postal codes by using information present on mail items, such as a destination address block. Important technology used by the vast majority of mail sorting machines are either Optical Character Recognition or bar code reading.

Frequently, post and carriers employ several subcontractors or trusted agents in the complex process of mail acceptance, sortation, transportation and distribution. Parties involved in mail unit acceptance, induction, processing, transportation and delivery are:

— originating postal operator (or a private carrier);

— destination postal operator (or a private carrier);

— consolidation contractor;

— transportation contractor;

— delivery contractor;

— bank (or other financial service institution involved in payment for mail unit acceptance, induction, processing, transportation and delivery functions).

The originating postal operator or carrier may be the only party that is involved in mail unit/aggregate processing, transportation and delivery. Such is the case when the mail unit destination address is within geographical boundaries of a country or a territory where the originating postal operator is authorised to provide mail communication services and when the originating postal operator does not employ any other legal entities to perform such services. Alternatively, there could be several other legal entities involved in providing mail communication services such as contractors and other postal operators or private carriers. There could also be several intermediate carriers and contractors between the originating and the destination postal operators or carriers, for example transportation contractors described below.

Agents involved in mail unit acceptance, induction, processing, transportation and delivery are various automated, semi-automated and manual systems and their operators such as; cullers, facers/cancellers, mail sorters, containerisation systems, scanning devices, mail transportation vehicles, railroad cars, airplanes and mail clerks.

In many instances, a recipient of the mail unit could be a party other than the party intended as a recipient by the sender or parties that are intended as recipients *in addition* to the main message recipient. These can include an unintended recipient (for example when the destination address is wrong), an undesired recipient (for example in the case of stolen mail) or a third trusted party such as a law enforcement agency. Parties involved in mail unit receipt and subsequent processing are:

— intended recipient;

— unintended recipient (party that obtained mail unit as a result of an inadvertent error such as delivery to a wrong address or recipient);

— undesirable recipient (party that obtained mail unit as a result of illegal or unauthorised activity such as mail theft);

— authorised third parties such as law enforcement agencies and legal institutions (parties that are authorised by mailers to receive information about mail units);

— bank (or other financial service institution involved in payment for mail receipt and subsequent processing).

Parties participating in the mail communication system are usually involved in mail units physical handling (e.g. sorting, transportation, delivery), in mail unit-related information handling (e.g. tracking information capture and communication) and/or in mail unit-related financial transaction handling (e.g. postage payment). The defining characteristic of a party is its legal status as an entity that is entrusted in the execution of any of the aforementioned aspects or activities of the mail communication process.

NOTE 1 All parties and agents considered in this document should be uniquely identifiable within the context of given application. Methods of assigning identifiers to various parties and objects are addressed by ISO Standards (see bibliography).

NOTE 2 Roles of the parties and agents involved in the mail communication systems can be codified and published (i.e. made available to all interested parties) in the form of standardised code lists.

NOTE 3 It should be stressed that the list of parties, their agents and their roles is not exhaustive and intended for illustrative purposes. New parties and agents are continuously introduced when mail communication systems are undergoing complex changes associated with introduction of new technology, change of ownership (privatisation) or change in the legal status of protected services (liberalisation). The framework of the present document is designed to accommodate the introduction of new parties and agents.

4.2.1 Party attribute

Party attribute is a useful concept that allows for the capture and storage of information related to the party that is not covered by the party name or its identifier. Examples of party attributes are the party's functional role in the process, its classification code according to the industry classification system, as an identifier for a contract that governs party's relationship with another party or parties, various restrictions concerning the party's role and similar parameters.

4.2.2 Agent attribute

Agent attribute is a useful concept that allows the capture and storage of information related to the agent that is not covered by the agent name or its identifier. Examples of agent attributes are the agent's functional role in the process, year of production (in case of equipment), name of the manufacturer, various technical parameters such as; scanning resolution, number of output bins, and similar parameters.

4.3 Physical objects

4.3.1 Mail item

A mail item is a single (indivisible) object that is physically moved through the postal distribution network from the sender to the recipient. Mail items typically carry a recipient destination address or a pointer to it. Examples of mail items are post cards, letters, flats, express mail items, parcels and packets.

4.3.2 Mail unit

The concept of mail unit is a generalization of the concept of mail item. Mail unit is one of the central and most fundamental concepts in mail communications. Mail unit is a physical object that is transported at least through a portion of the mail communication network. Mail units by definition are either individual mail items or containers that consist of mail items and receptacles. Mail units are distinguished from empty mail containers that are defined as receptacles. Examples of mail units are post cards, letters, flats, parcels, packages, irregular parcels and pieces, and various receptacles containing mail such as; flat trays, letter trays, IPC trays, sacks, pallets, bundles, baskets, roller cages, containers, refrigerated containers, unit load devices, transportation units. Each mail unit has a lifetime that is understood as the period of time between creation of the mail unit or its entry into the mail communication system and its exit from it or its dismantling (in the case of composite mail units that are collections of mail items or other mail units).

Mail units can be a single (individual, prime, indivisible, atomic) or compound. Single mail units are post cards, letters, flats, packages, parcels and similar objects. Compound mail units are collections of single mail units such as; a tray, a bundle, a sack, a pallet, a roller cage containing a collection of trays, several pallets containing trays that are loaded onto a vehicle or an airplane. As a physical unit (object), a mail unit has a unique and identifiable location at any given point in time (date) during its lifetime. The mail unit is usually one of the primary targets of analysis and monitoring (the atomic object). The mail unit is characterized by its attributes. Mail units can be assembled together in a single container or a collection of containers for the purpose of transportation or processing. Mail units could be nested in the sense that smaller size containers can be assembled together in larger size containers, for example trays assembled together in a palette. Each individual container together with mail units contained therein is a mail unit in its own right that can be referenced through its identifier(s) and is fully characterised by its attributes.

All mail units considered in this document should be uniquely identifiable within a given application.

4.3.3 Mail receptacle

Mail units are transported using various types of containers. It is frequently important to distinguish between empty containers and containers that carry mail units. Mail receptacle is a generic term that is used to indicate an empty container. Examples of mail receptacles are trays, IPC trays, sacks, pallets, baskets, roller cages, refrigerated containers and unit load devices. Mail receptacles may or may not have unique identifiers. RFID technology is frequently used for identification of large containers carrying cross border mail units.

4.3.4 Mail aggregate

See UPU Glossary for explanations and comments.

4.3.5 Aggregate

The concept of aggregate is at the highest level of abstraction. All possible collections of mail items and entities constitute aggregates. Specific instances of aggregates are named (for example: mail aggregate, despatch, consignment, submission group and induction unit which are defined in UPU glossary). When an aggregate has a unique name, it is accompanied by a description of a commonality criteria, which transform a collection of mail units into an aggregate. These criteria are usually expressed in terms of common mail unit attributes, although it could be simply enumerated.

Unlike mail unit, an aggregate does not have to be constrained to form a physical unit and thus it does not necessarily have a single identifiable location at any given point in time (for example, a part of an aggregate might be in one place, while another part could be in another place). Examples of named aggregates are mailing, mailing submission, induction unit, consignment and mail action. In particular, mailing is an instance of an aggregate that corresponds to the set of mail units (e.g. letters) to be generated as a result of a specific business process, such as an invoicing or advertising campaign.

All aggregates considered in this document should be uniquely identifiable within the context of a given application.

4.3.6 Mailing submission

From a mailer viewpoint, mailing submission consists of mail units that are hierarchically organised, for example into letters, trays of letters, receptacles containing trays of letters etc. These mail units typically have directly measurable characteristics (attributes).

From a postal operator viewpoint, mailing submission can form a part of a larger aggregate, e.g. an induction unit. The single hand-over transaction is the purpose (application) for the aggregate defined as the induction unit. Each mailing submission is always associated with one date (the date of submission) and one location (submission or acceptance/entry location). All mail units that are part of the mailing submission are handed over to the postal operator at the same time and at the same place (the place of the single hand-over transaction).

It should be noted that directly measurable characteristic means that the characteristic of the mail unit can be obtained by a direct measurement as opposed to the computation (e.g. weight of an aggregate can only be computed as the sum of the weights of its component mail units, while the weight of a mail unit is typically directly measurable).

All mailing submissions should be uniquely identifiable within the context of a given application.

4.3.7 Induction unit

Typically, an induction unit consists of multiple mailing submissions accepted or rejected during a given period of time, for example one day. These multiple mailing submissions are considered together (as a unit) to meet postal operator’s financial or operational information processing needs. For instance, induction units frequently serve as the basis for invoicing the mailer.

Induction units should be uniquely identifiable within the context of a given application.

4.4 Informational objects

This clause provides a detailed explanation concerning various informational objects that form the entity-relationship model of mail communication system.

4.4.1 Mail unit attribute

Mail unit attribute is a central concept in the entity-relationship model describing a mail communication system. All mail units (including mail items) are fully characterised by their attributes. Mail unit attributes can be either primary or derived (composite). Values of the primary attributes are usually stored while values of the derived attributes are usually computed when needed. Values of the primary attributes are either directly measured or assigned, while values of the derived attributes are computed from the values of other primary or composite attributes.

Mail unit attributes are always referred to by name. Since all mail unit attributes can be represented by a data value, a pair (mail unit attribute name, mail unit attribute value) contains all application-required information for a given attribute. For simplicity, the pair (mail unit attribute name, mail unit attribute value) is frequently referred to as the *name-value pair*.

The definition of the mail unit attribute is not constructive in the sense that it does not allow for a constructive test that would to determine whether a given object related to the mail unit is in fact this mail unit attribute. Mail unit attributes are empirically selected, listed, classified and explained in more detail in UPU M33 standard. The list of mail unit attributes is a living list and it is open to additions, changes and deletions as experience in using the concept mail unit attribute evolves.

All mail unit attributes have an initial or “null” value. Value of a mail unit attribute is set to a “null” value when there is no available information as to the actual value of the attribute.

Different types of mail units have different attributes, although some attributes characterise mail units of all types. For example, mail items such as letters could have ink colour used to create a destination address and envelope substrate colour as their single valued attributes while compound mail units such as pallets cannot. On the other hand all mail units have a weight as their attribute.

The value of a mail unit attribute is a function of time. However, the time itself is not an attribute of mail unit, but rather a parameter on which some mail unit attributes are dependent. In this document time is expressed as a date in accordance with a commonly accepted practice in international standards, namely in the following format yyyy-mm-dd-T:HH:minmin:ssZ, where “yyyy” is the year, “mm” is the month, “dd” is the day, “HH” is the hour, “minmin” is the minute, “ss” is the second etc.

The mail unit attributes could come from a variety of sources, for example: mail unit itself or a database of information related to the mail unit. Some attributes can have the same nature, but originate from different sources (e.g. the destination address information as present on the mail unit (printed) and the destination address information stored in a postal database). The trustworthiness of a mail unit attribute value is a function of its source, communication channel and the ability of the party concerned with the veracity of the information to compare values of attributes obtained from multiple sources.

Mail unit attributes fall into two broad categories, attributes that are time and process dependent and all other attributes. A prime example of a time-dependent attribute is mail unit location which is the fundamental attribute of track and trace application.

The attributes could be inherent or assigned. An example of an inherent attribute is the attribute “type” that takes value of “letter”, “postcard”, “tray”, “roller cage”, “sack”, “palette”, transportation unit, etc. (these values are usually codified and published in a commonly accessible code list “mail unit type code list”). Another example is the attribute “position at the time of the last observation”. It signifies when and where the mail unit was last observed.

Other examples of inherent attributes are “weight”, “dimensions” and general physical characteristics such as color.

It should be mentioned that the actual values of weight, dimensions, and other inherent mail unit attributes are rarely known with absolute certainty and precision.

Mail units usually carry a variety of markings containing data elements required for their processing and delivery. These markings include destination and origination addresses, digital postage mark, various endorsements (e.g. “par avion”), tracking identifier, special service indicator, etc. Location, size and other characteristics (e.g. print quality defects) of markings present on mail units are examples of assigned mail units attributes as they are in essence “assigned” either by the mail creator or by the consolidator or by the postal operator during mail creation or processing.

Examples of commonly encountered mail unit attributes are:

— mailunit.mailunit.acceptance-location;

— mailunit.mailunit.original-delivery-address;

— mailunit.mailunit.originator;

— mailunit.mailunit.payer;

— mailunit.mailunit.return-address.

These and many other mail unit attributes are defined and described in UPU M33 standard.

4.4.2 Mail receptacle attribute

The concept of mail receptacle attribute allows the expression of either basic physical parameters that are common to all receptacles or their location and associated information. These attributes include type, weight, dimensions, nominal capacity, construction material, handling constraints and location. Examples are:

— mailreceptacle.weight;

— mailreceptacle.location;

— mailreceptacle.dimensions;

— mailreceptacle.nominal-capacity;

— mailreceptacle.construction-material;

— mailreceptacle.handling-constraints.

Where a mail receptacle is a recipient mail box, the concept of mail receptacle attribute allows for expression of other properties that can be linked with the mail box or associated structure (such as an apartment or office building or a house).

4.4.3 Aggregate attribute

Similarly to mail units, aggregates are fully characterised by their attributes. Most of the comments concerning the concept of mail unit attributes in 0 are also applicable to aggregates. The fundamental difference between the concepts of mail unit and aggregate is the fact that aggregate does not have to be constrained to form a physical unit and therefore certain attributes applicable to mail units are not applicable to all aggregates. A prime example is the value of the attribute *mailunit.location* at a given moment in time. Another example is the value of *mailunit.dimensions*.

Examples of commonly encountered aggregate attributes are:

— mailset.application.name;

— mailset.component;

— mailset.originator;

— mailset.accounting-method;

— mailset.component.mailunit.ID.

These and many other aggregate attributes are defined and described in UPU M34 standard.

4.4.4 Aggregate catalogue

The concept of the catalogue of the aggregate is motivated by the need to distinguish between the names and the values of different objects that are considered in entity-relationship models. When attributes of a (subset) of mail units included in the catalogue of an aggregate acquire values in the context of a particular application, the resulting informational object becomes a statement. For example, when the application is mail submission, then the corresponding informational object is the statement of mailing submission.

4.4.5 Statement of mailing submission

From a mailer viewpoint, mailing submission consists of mail units that are hierarchically organised, for example into letters, trays of letters, pallets containing trays of letters etc. These mail units typically have directly measurable characteristics (attributes). From a postal operator viewpoint, mailing submission can form a part of a larger aggregate, e.g. an induction unit.

The single hand-over transaction is the purpose (application) for the aggregate defined as the mailing submission. Each mailing submission is always associated with one date (the date of submission) and one location (submission or acceptance/entry location). All mail units that are part of the mailing submission are handed over to the postal operator at the same time and at the same place (the place of the single hand-over transaction).

It should be noted that directly measurable characteristic means that the characteristic of the mail unit can be obtained by a direct measurement as opposed to the computation (e.g. weight of an aggregate can only be computed as the sum of the weights of its component mail units, while the weight of a mail unit is typically directly measurable).

The statement of mailing submission is an informational object that contains all information describing physical object (aggregate) defined as a mailing submission. The following table provides the mapping between the physical world of mail units and sets and the world of informational objects that represent physical world in computer data models (e.g. in entity-relationship models).

Physical world	Description (Information)
— aggregate	— catalogue of aggregate
— mailing submission	— statement of mailing submission
— induction unit	— statement of induction unit

Statements of mailing submissions should be uniquely identifiable within the context of a given application.

4.4.6 Induction unit

Typically, an induction unit consists of multiple mailing submissions accepted during a given period of time, for example one day, and combined together to meet the postal operator's financial or operational needs. For instance, induction units frequently serve as the basis for invoicing the mailer.

4.4.7 Electronically exchanged message

The concept of an electronically exchanged message is a useful generalization for a variety of computerised documents that are commonly encountered in a mail communication system. Many application requirements are relevant to all EEMs and not just specific types, such as a statement of mailing submission. For example, communication channel security requirements can be applicable to many or all EEMs.

Electronically Exchanged Messages can be sent and received through the use of electronic communication networks, public or private, as well as through the use of portable electronic media such as; CD ROMs, magnetic diskettes, tapes and machine-readable documents. Examples of EEMs include statement of mailing submission (SMS) and in general a statement of aggregate.

All EEMs should be uniquely identifiable within the context of a given application

4.4.8 Observation

Observation is one of the most important informational objects defined in this document. It contains all recorded (or stored) information about a mail unit at a given date. A collection of observations provides a description of a progression of a mail unit through the mail communication system at discrete moments in time. The observation information is stored and/or communicated in a data structure referred to as the observation record. There could be multiple records of the same observation. The observation record does not reflect the method used to obtain information contained in the record. The notion of how observation information has been obtained is reflected in the concept of observation attribute, explained below.

There are circumstances when the value of a mail unit attribute cannot be captured with complete certainty. In this case, the value can be treated as a random variable with a known or unknown distribution, and parameters of this distribution such as its expected value and standard deviation can be reported instead of the absolute value of the attribute.

As all other objects, observation considered in this document should be uniquely identifiable within a given application.

Formal description of the observation can take a form:

$$\text{Observation [mailentity (ID)]} = \{(A1), (A2), \ldots, (AN)\} / \text{Date},$$

where

mailentity (ID) is an identifier for the mail unit that is being observed; and

(A1), (A2), …, (AN) are values of the attributes *A1, A2,…, AN* respectively taken at the moment of time defined by the date (e.g. yyyy-mm-dd-T:HH:minmin:ssZ).

4.4.9 Observation attribute

The purpose of the observation attribute is to collect important information that is not captured in the observation record. Examples of observation attributes are values describing conditions under which the observation (mail unit attribute values) was taken and identity, role and attributes of the party or agent responsible for actions taken at the date of the observation. Identity of mail sorting machine (agent) that scanned a given mail unit identifier as well as its scanning resolution and illuminating condition provide useful examples of observation attributes.

The date of the observation together with its identity and the identity of the mail unit that is being observed are the only unconditionally required attributes of the observation. This means that these three data elements should always be present in any observation.

There are multiple ways to identify the party that is responsible for the actions taken at the time of the observation. It can be identified through its assigned identifier, its postal address, its location expressed in terms of its geographical coordinates, or all of the above. The role of the party responsible for the action (party attribute named “role”) can be codified (see for example UPU code list 153).

4.4.10 Expectation

The purpose of expectation is to allow for a formal expression of needs and desires of concerned parties regarding mail units when these mail units are not under direct control of such parties. Expectations that are created by customers and communicated to postal operators serve the purpose of specifying desired services and identifying discrepancies between expected and performed services.

The concept of expectation allows for a formal definition of (custom-tailored) non-conditional services and it forms a special case of postal product definition. Conditional services are services when the type of the information that could be made available to customers is dependent on the actions taken by the postal operator or location of the mail unit. For example, if a mail unit could not be delivered due to the absence of the recipient, the information about such an event including information describing present location of the mail unit could be made available to the sender.

Unlike observations, expectations can be defined over a range of dates. The amount of information held in a record for an expectation defined over a date range is larger than the amount of information held in a record for an expectation defined for a date.

The expectation information is stored and/or communicated in a data structure referred to as the expectation record. There could be multiple records for the same expectation. The expectation record contains anticipated attribute values, the consistency of which, however, cannot be ascertained in the same way as the consistency of attribute values in observations.

All expectations considered in this document should be uniquely identifiable within a given application.

NOTE 1 There is no analogue to observation attributes in the context of expectations because it doesn’t seem to be reasonable to assume that customers or other parties would anticipate, know or impose conditions, parameters or identities for actual measurements of mail unit attribute values.

NOTE 2 It is expected that when expectations are created by mailers or recipients, the values of attributes included in expectations will be consistent with the ranges of values accepted by postal operators

4.4.11 Postal product/service

The main purpose of a formal definition for a postal product is to provide a set of automatically executable instructions for a mail creator and postal operator aimed at smooth delivery of postal products. How then, can a postal product/service be formally defined using a set of concepts and definitions introduced in this standard? A straightforward and somewhat naïve approach would be to look at existing services and identify and generalise their defining characteristics. For example, a period of time elapsed from deposit/induction of the mail item to the moment of its delivery (however delivery is defined) is one of the most common parameters of the service definition. In many European countries, the “first” class mail is defined by this parameter when it is equal to “D+1”, where “D” is the day of induction. In addition, the first class mail service is also defined by the rule governing exception processing, namely that the first class mail service requires the return of the undeliverable mail item to the mail item originator or its authorised agent or agents. Further, other parameters such as “security” or “guarantees” can be introduced as additional features of the service. A prime example of these features is “track & trace” information that is expected to be supplied to the originator of the mail item or entity or its agent(s). Still further parameters that could be specified by the originator are mail item or entity pick-up time and processing constraints (e.g. registered mail). Yet still further parameters reflect the nature of the mail unit itself as it affects the cost and salient characteristics of its processing within postal distribution network (e.g. size, weight, work-sharing level). This suggests that a comprehensive definition of the postal product capable of accommodating a broad variety of existing and future products should be

specified in terms of rules that operate on mail unit attributes (defining mail unit) and observations (defining information reflective of postal processing and their distribution and access), where mail unit attributes are understood very broadly.

Finally, such rules should be agreed upon between postal operators and customers in such a manner that products offered by operators and products requested by customers should match and cause no confusion on either side. Thus, the definition of the postal product is an agreed-upon set of rules operating on the values of mail unit attributes governing both actions to be taken on the mail unit and communication of observations to all authorised parties. Several important observations are as follows.

The domain for the rule defining the product in terms of attributes is a subset (possibly proper subset) of mail unit attributes and their values. The domain is specified by the rule itself.

The rules operating on the values of mail unit attributes could be expressed implicitly or explicitly. Some simple rules (and their corresponding postal products) can be expressed directly in terms of the concept of expectation defined in this standard. In the case of traditional postal products, the rules are published together with their corresponding prices and referred to by conventional classification such as first class, second class or express mail service. In this case, the rules are implicitly referenced by putting endorsements on mail units (for example: first class mail) and the rules are selected and controlled by the service provider (no negotiation is involved). As an example, the first class mail service is defined as a rule operating on the values of two mail unit attributes, namely: mailunit.original-delivery-address and mailunit.class-of-service. By the default agreement, the rule is to deliver mail unit to the location specified by the attribute mailunit.original-delivery-address within a specified time period (e.g. D+1). Another example is first class mail service with track and trace. The set of values for the mail unit attributes for the rule governing actions taken on the mail unit consists of mailunit.original-delivery-address and mailunit.class-of-service and mailunit.customer-applied-ID. The set of mail unit attributes for the communication of observations consists of all values of the attributes mailunit.location and mailunit.process. The rule is to deliver the mail unit to the location specified by the value of the attribute mailunit.original-delivery-address within a specified time period and make available to the mail unit originator, (or its agent(s) or other authorised parties) values of the mailunit.location attribute whenever and wherever possible.

A more complex example of a postal product is a product described by the following set of requirements:

— mail item is required to be delivered on a given date (date-certain delivery);

— postal operator is required to provide mail originator with delivery confirmation in terms of an observation taken at the delivery of the mail item into recipient mailbox;

— postal operator is required to provide mail originator with address correction information where the destination address as presented on the mail item contains errors;

— postal operator is required to provide mail originator with information describing print quality defects with regard to the mail item destination address and digital postage mark.

In this case the set of mail item attributes that are needed for the product description are:

— mailitem.ID;

— mailitem.delivery-date;

— mailitem.originator;

— mailitem.original-delivery-address;

— mailitem.replacement-delivery-address;

— mailitem.original-delivery-address-print-quality-defect;

— mailitem.dpm-print-quality-defect.

The observation of the last four attributes and the mailitem.ID is to be taken at the time of mail item processing (for example by a mail-sorting machine) and the observation of the first two attributes is to be taken at the time of mail item delivery into a recipient mailbox.

Therefore, the rule defining the product is to deliver the mail item to the location identified by the value of the mailitem.original-delivery-address (if deliverable) or by the value of mailitem.replacement-delivery-address at the date identified by the value of mailitem.delivery-date and send information contained in the observations described above including the value of mailitem.replacement-delivery-address (if it is not NULL value) to the party identified by the value of mailitem.originator.

It is conceivable that in the future, postal service providers will negotiate postal products with their customers and in this case the subset of mail unit attributes and their values and the rules might be explicitly communicated using either the mail unit itself as a carrier of information or a computer data structure referenced by a pointer on the mail unit.

The mail unit is sometimes implied (not explicitly associated) with the postal product, for example in the case of the address correction service that cannot involve actually posting a mail unit into a postal distribution network. In this case, the service is performed by the postal operator, by correcting computerised address information provided by a would-be mailer without actually processing the mail unit.

4.4.12 Postal product/service attribute

Postal product attribute is a useful informational object designed to capture information that is not captured in the postal product object. Postal products can also be codified. In this case, the code for the product is a postal product attribute that takes its value from a code list. Price for the postal product can also be considered as its attribute. Since the price is somewhat arbitrary and in principle can be negotiated, it makes sense to keep the price out of the product itself. It also allows for negotiations between postal operators and their customers without changing basic data structures defining products. Similarly, financial and technical details (such as; refunds conditions, expiration date, allowed induction points and times etc.) of the contract between a mailer and a post can be considered as attributes of negotiated services as well as attributes of the contract. Thus, the concept of postal product attribute allows the system to separate informational needs of postal operations from informational needs of postal finance and marketing and also simultaneously to accommodate similar needs of mail senders.

4.4.13 Event

Within each of independent domains in the mail communication system the information is captured, stored and communicated. This means that a decision has to be made regarding what and when information is to be captured, stored and communicated. Capture and storage of information is accomplished using the concept of observation. The main role of the “event” concept is to provide a trigger mechanism for the communication of “significant” (or “valuable”) information (i.e. an observation) to all interested and authorised parties in mailer, postal and recipient domains. Once a “significant” change in the value of an attribute of the mail unit under consideration has occurred it can be time to communicate such a change. In other words, the valuable information that is to be communicated consists of a significant attribute value change or lack thereof (since sometimes the absence of any change represents valuable information that is required to be communicated explicitly).

A significant change (or a deviation) is meant to be a change (or a deviation), the knowledge of which has identifiable value to one or more parties in the mail communication system. *Identifiable value* is meant to emphasise that the knowledge of a change between any two observations or between an observation and an expectation is clearly useful to one or more parties involved in the mail communication system. The determination of significance of a change or a deviation is outside of the scope of this document. Such significance, as always, is “in the eyes of the beholder” and as such should be determined by the recipient of the event information and thus is strictly a function of the application. The level and the meaning of significance has to be communicated to the party capturing information or agreed upon beforehand between the parties involved in the communication of event information in order to trigger such communication. One convenient way to communicate the level and the meaning of significance is the postal product, more precisely, the rules that form a part of a postal product description. These rules are also included in the event attributes.

Exceptional events always require the presence of an expectation. This means that when expectations are not explicitly specified and communicated by recipients of event information, the expectations are provided by default (through basic requirements and agreed upon specifications).

Events usually occur as a result of physical or information processing activity, for example a transfer of a mail unit from one location to another or the electronic capture of information (scan) from the mail unit. Events can also have a purely electronic nature, meaning significant change occurring in the electronic (information) space without any equivalent in the physical world.

Events are always related to a single, identifiable, mail unit. In addition, the mail unit is associated with a single identifiable postal product.

There could be multiple observations associated with the event.

Events are detected (computed) by comparing the values of attributes between observations or between observations and expectations taken at different dates.

All events considered in this document should be uniquely identifiable within a given application.

The following XML schema (Figure 2) describes the structure of the information for an event. Each event is uniquely identified within the application that computes the event information. As shown in the figure, the event information also includes a date, which indicates either when the event information is computed or communicated. The event information contains mail unit information, i.e. the mail unit identifier and the postal product linked to the mail unit. In addition, the event includes rules described in the postal product and used to make decisions guiding the computation of event information. Finally, the event information includes multiple observations and, optionally, expectations.

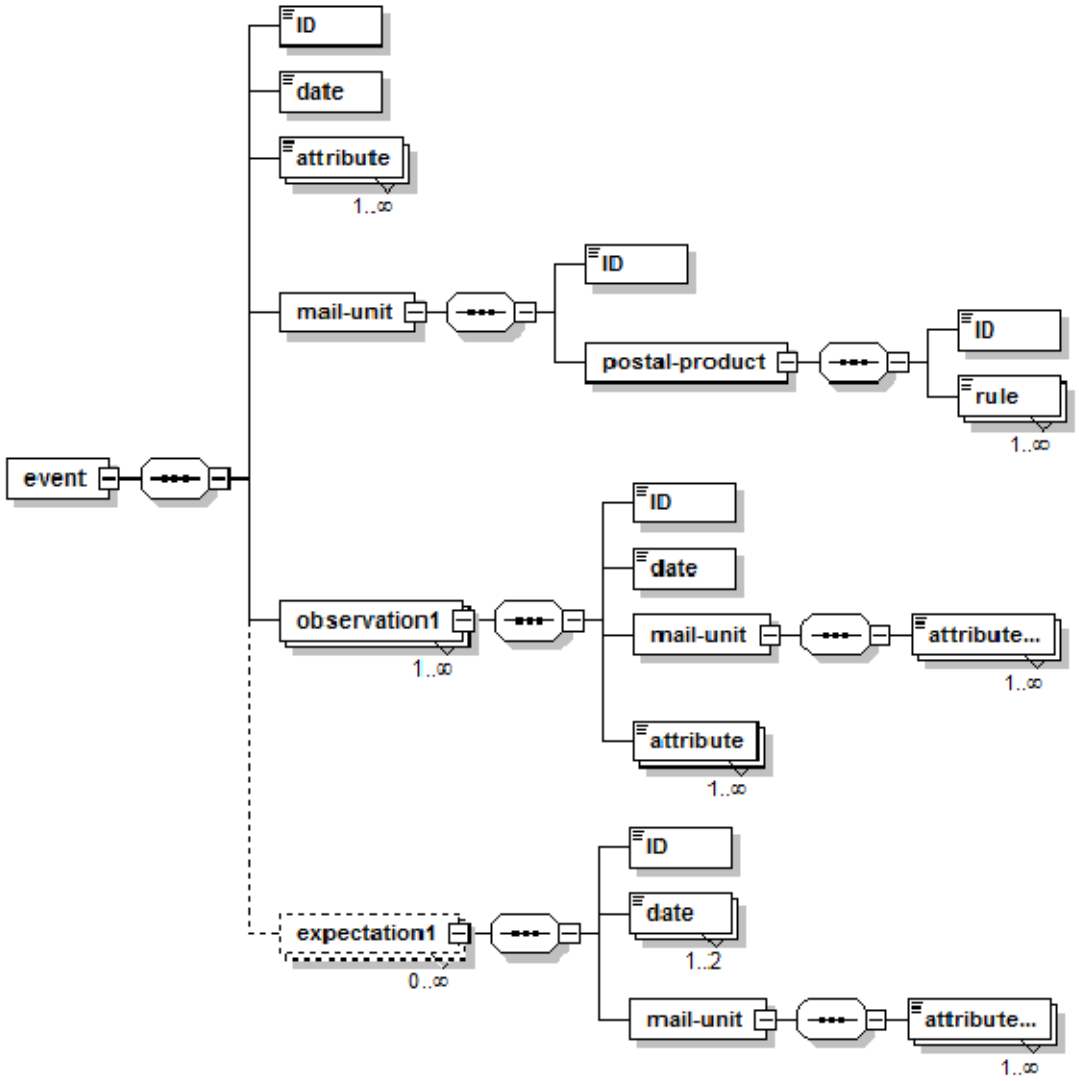

Figure 2 – Event structure

4.4.14 Event attribute

As it is the case with attributes of other objects introduced and described in this standard, the event attribute is a useful informational object designed to capture useful information that is not captured in the event object itself.

A prime example of the event attribute is the value of the threshold that has to be exceeded by the difference between the values of the mail unit attribute under consideration in two observations (or expectations) for the event to occur. Another good example of the event attribute is the name or other identity of the party that has specified the value of the threshold mentioned above.

The concept of the event attribute allows for the expression of complex logical rules concerning determining the occurrence of the event. For example, it is possible to specify that for an event to occur, several mail unit attributes would have to have specific values and the differences in values of several other attributes would have to exceed certain agreed-upon thresholds.

This can be expressed using the names of the attributes and logical operators such as AND, OR, and NOT. In this fashion, any authorised party involved in mail communication would be able to compute the occurrence of an event by using the values of the attributes and by applying event-defining rules. Communication of such rules from the party that defines these rules to the party (parties) that are required to apply these rules can be accomplished by either encoding them on the mail unit itself or by referencing external data storage. The definition of the rules and the encoding mechanism is outside of the scope of the present document.

Event attributes are presented by explicit listing (e.g. by name, by various (possibly linked) identifiers, by time period during which event took place etc.).

List of event attributes:

— *event.mail.entity-attribute-threshold* – threshold that has to be exceeded by the difference between the values of the mail unit attribute under consideration in two observations (or expectations) for the event to occur;

— *event.mail.entity-attribute-threshold.party-ID* – name or other identity of the party that has specified the value of the event.mail.entity-attribute-threshold;

— *event.code* – descriptor of the event being reported, expressed as a code in a publicly accessible code list (see for example UPU codelist 144 as a model);

— *event.message-recipient-ID* – party identifier for the event message recipient;

— *event.exception-reason* – reason for the deviation that occurred between expectation and observation, expressed as a code in a codelist.

4.5 Processes

Processes in the integrated mail communication system should be linked or interfaced through appropriate exchanges of information. Thus, all processes that are referred to or considered in the present standard are viewed as computer-driven where computers collect relevant process information. Other processes, although always present in mail communication systems, do not result in computerised information that can be exchanged between the parties involved and therefore are not considered here. Oval blocks in the diagrams representing processes in the three principal domains indicate points in the processes where informational objects described in this standard can be collected, formatted and communicated.

In mail communication systems, mail units are the subjects of continuous processes throughout their life-cycle (from inception to discard). The processes comprise both physical processes (e.g. mail unit reorientation as a result of facing or a mail unit transfer from one location to another) and information processes (e.g. capturing and interpretation of data present on mail unit).

From the view point of the mail communication system reference model, processes, both physical and informational, can be represented and described as a series of events, each of which is described by a set of observations.

4.5.1 Mailer domain process

The mailer domain process is described here in the most generic terms and does not take into account many variations and exceptions that take place in practical, actually encountered environments. Real processes in the mailer domain are always country, application and volume dependant and could not be described in any detailed fashion within the scope of this standard. Some sub-processes (or activities) sketched here happen only in a large volume mailer environment and are highly automated and computer-driven, while some others are present in almost any environment, but might be performed in a totally manual manner without any equipment at all. The purpose of providing the following description is to establish terminology and the very basic common features for some very commonly encountered mailer domain processes.

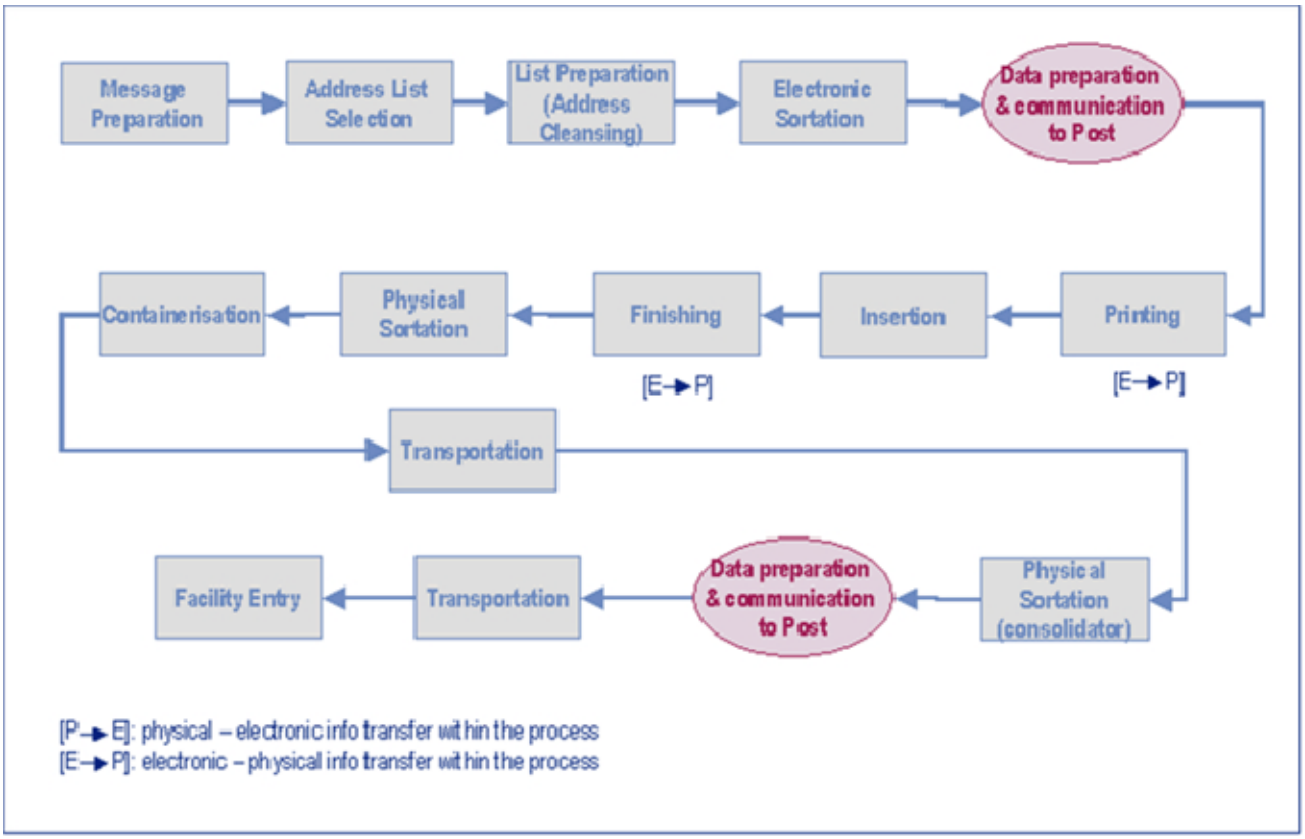

Figure 3 – Mailer domain process

4.5.1.1 Message/content preparation

Message or content is information physically represented on a substrate or an object that is being sent by the mail unit originator to its recipient. Message/content is the sole reason for communication. Postal standards are typically not concerned with messages. Nevertheless, message preparation is a critical part of the mail preparation process and can affect subsequent steps. Message is usually also linked and coordinated with the recipient mailing address.

4.5.1.2 List selection

The process of address list selection is typical for relatively large mailings. In the case of small mailings or a single mail unit, the process of list selection is a simple process of recipient (destination) address selection for a given mail unit. As mentioned, the destination address has to be coordinated with the content of the mail unit.

4.5.1.3 List preparation

Address list preparation usually involves a process of quality control in order to avoid sending mail units that cannot be delivered or can be delivered only with additional expenses usually associated with exception processing. The process of address cleansing is executed when a party (e.g. postal operator) maintains a database of correct addresses and makes it available to mailers or their agents.

4.5.1.4 Electronic sortation

Electronic sortation is common when there is a discount offered to mailers for submitting their mailings already sorted (organised in a certain order that allows it to bypass certain processing steps that are otherwise necessary). This discount is sometimes referred to as a work-sharing discount. Electronic sortation is performed when mail units can be physically created without constraints concerning their “natural” order of creation. In some cases mail units have to be produced in a specific sequence (e.g. according to a recipient account number or identifier) that can interfere with electronic sortation.

4.5.1.5 Printing

The process of printing typically involves the printing of message(s) as well as printing the destination address. Sometimes when so-called “window” envelopes are used, both the message and destination address are printed in one step. The process of printing is typical for business-originated mail. Messages and addresses for mail units originated by individual mailers and households sometimes are handwritten which can cause manual processing on the part of the postal operator.

4.5.1.6 Insertion

Insertion refers to a paper-handling mechanical process whereby mail units are assembled together and inserted into a carrier envelope.

4.5.1.7 Finishing

Finishing typically involves printing a Digital Postage Mark (DPM) (sometimes referred to as an Indicium) and additional information such as; Facing Identification Mark (FIM) and mailer-selected advertising slogans. Finishing can require the determination of the mail unit rating parameters such as its weight or dimensions that are indicative of the tariff (postal rate or charge) to be paid by the payer for products/services that are expected to be rendered. The main purpose of finishing is to enable mailers to have an effective access to postal products.

4.5.1.8 Physical sortation

The main purpose of physical sortation is to obtain a discount or a better and faster service from the postal operator. Physical sortation can be performed by the mail originator or its agent (for example a consolidator or a contractor) depending on whether the mail originator has sufficient mail volume or required equipment and expertise. Physical sortation is more cumbersome and expensive than electronic sortation and is performed only when electronic sortation is not possible, for example when mail units created independently by different processes are merged or when mail units have to be prepared in certain order.

4.5.1.9 Containerisation

Containerisation is a necessary step since mail units could not be transported without containers. Containerisation involves the use of multiple receptacles that are country and application dependent.

4.5.1.10 Transportation

Transportation is a generic term. The nature and the sequence of specific activities comprising “transportation” can vary from mailer to mailer and is affected by the rules of induction that are country and postal facility dependent. Transportation usually involves the loading and unloading of transportation vehicles.

4.5.1.11 Induction

The process of induction is common to both mailer and postal domains. The process of induction or entry occurs when an aggregate or a mail unit is presented for induction into the postal operator distribution network by the mail submitter. The process of induction includes the process of mailing submission verification (typically performed by the postal operator) that ensures that the submission complies with postal revenue protection and operational requirements. The process of induction typically applies only to controlled acceptance or controlled entry mail (CAM or CEM). The verification normally involves payment (or accounting) accuracy and mail quality check. The process of induction can result in either acceptance or rejection of the mailing submission in part or as a whole. Acceptance of a mail unit or aggregate can involve surcharges required to be paid by the submitter to the postal operator if the submission is found to be non-compliant with postal requirements.

4.5.2 Postal domain process

The postal domain process is described here in the most generic terms and does not take into account many variations and exceptions that take place in practical actually encountered environments. Real process in the postal domain is always country, application and infrastructure dependant and could not be described in any detailed fashion within the scope of the present standard. Some sub-processes (or activities) sketched here happen only in a large postal operator environment and are highly automated and computer-driven, while some others are present in almost any environment, but might be performed in a totally manual manner without any equipment at all. The purpose of providing the following description is to establish terminology and the very basic common features for some very commonly encountered postal domain processes.

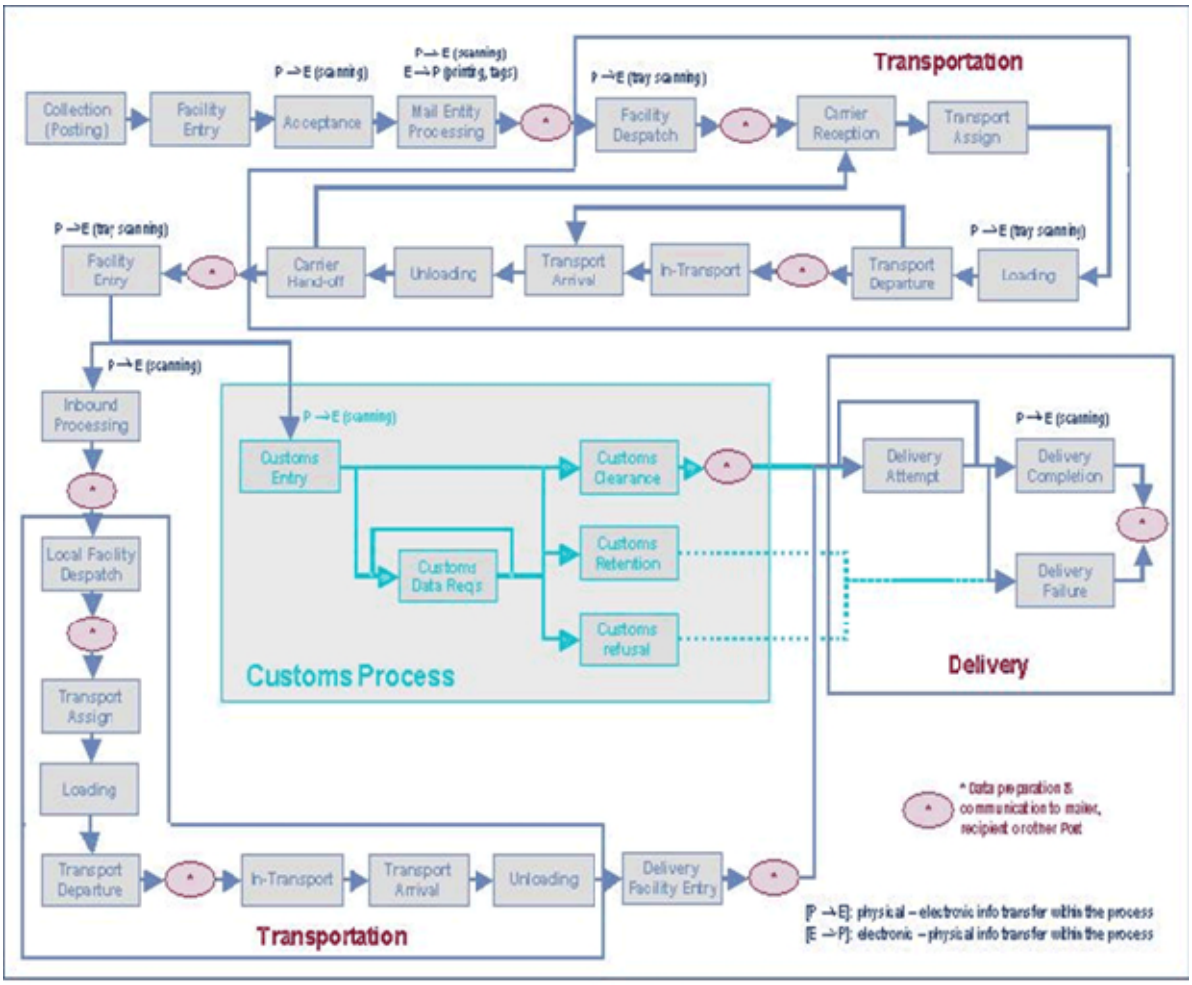

Figure 4 – Postal domain process

4.5.2.1 Collection

The process of collection involves gathering mail units from street letterboxes as well as from mailer premises. Loose mail units from street letterboxes and from mailer premises are containerised and transported for postal processing facility entry.

4.5.2.2 Facility entry

The process of facility entry can involve certain checks and document processing. Establishing the fact of facility entry can have significance for tracking and tracing mail units.

4.5.2.3 Acceptance

The process of acceptance is common to both mailer and postal domains. In the mailer domain it is termed as the induction process while in the postal domain it is the acceptance process. The process of acceptance or entry occurs when an aggregate or a mail unit is presented for acceptance into the postal operator distribution network by the mail submitter. The process of acceptance includes the process of mailing submission verification (typically performed by the postal operator or its contractor) that ensures that the submission complies with postal revenue protection and operational requirements. The verification normally involves payment (or accounting) accuracy and mail quality check. The process of acceptance can result in acceptance or rejection of the mailing submission in part or as a whole. Acceptance of a mail unit or an aggregate can involve surcharges that are required to be paid by the submitter to the postal operator if the submission is found to be non-compliant with postal requirements.

4.5.2.4 Mail unit processing

Mail unit processing is a generic term. The nature and the sequence of specific activities comprising “processing” can vary from postal facility to postal facility and from a postal operator to a postal operator.

Mail unit processing can involve culling, sorting and containerisation in preparation for transportation.

4.5.2.5 Transportation

Transportation is a generic term that describes a combination of several activities common to both mailer and postal domains. The nature and the sequence of specific activities comprising “transportation” can vary from facility to facility and from a postal operator to a postal operator and from mailer to mailer. Transportation usually involves loading and unloading of transportation vehicles, dispatch activities and can require recording of transport departure and arrival as well as transport assignment.

4.5.2.6 Customs process

The customs process involves examining dutiable mail units and their associated documentation for the purpose of assessing the potential payable duties. Customs process can result in clearance, retention or refusal. Customs process usually also results in generation and exchange of (computerised) information where such information is sent to postal operators and/or customers.

4.5.2.7 Delivery

The delivery process involves putting the mail unit into a recipient’s mail box or giving mail unit directly to a mail recipient. Delivery process can result in completion or failure. For some postal products, delivery process can also generate computerised delivery information that is made available to mail unit originator (or its authorised agents) or to another postal operator. In some instances, delivery process can render valuable data concerning change of address or disappearance/non-existence of a structure identified by the mail unit destination address.

4.5.3 Recipient domain process

Recipient domain process is described here in the most generic terms and does not take into account many variations and exceptions that take place in practical actually encountered environments. Real process in the recipient domain is always business, application and volume dependant and could not be described in any detailed fashion within the scope of this standard. Some sub-processes (or activities) that are sketched here happen only in a large volume recipient environment and are highly automated and computer-driven, while some others are present in almost any environment, but might be performed in a totally manual manner without any equipment at all. The purpose of providing the following description is to establish terminology and the very basic common features for some very commonly encountered recipient domain processes. Formal after-postal delivery process exists only in a business environment when a fairly large volume of incoming mail is delivered. The after-delivery process can include payment of postal charges (e.g. for business reply mail or COD charges), incoming sortation, opening of mail units, processing of messages, forwarding and return to the mailer domain via postal domain.

Individual mail recipients and small businesses typically do not employ any formal after postal delivery process.

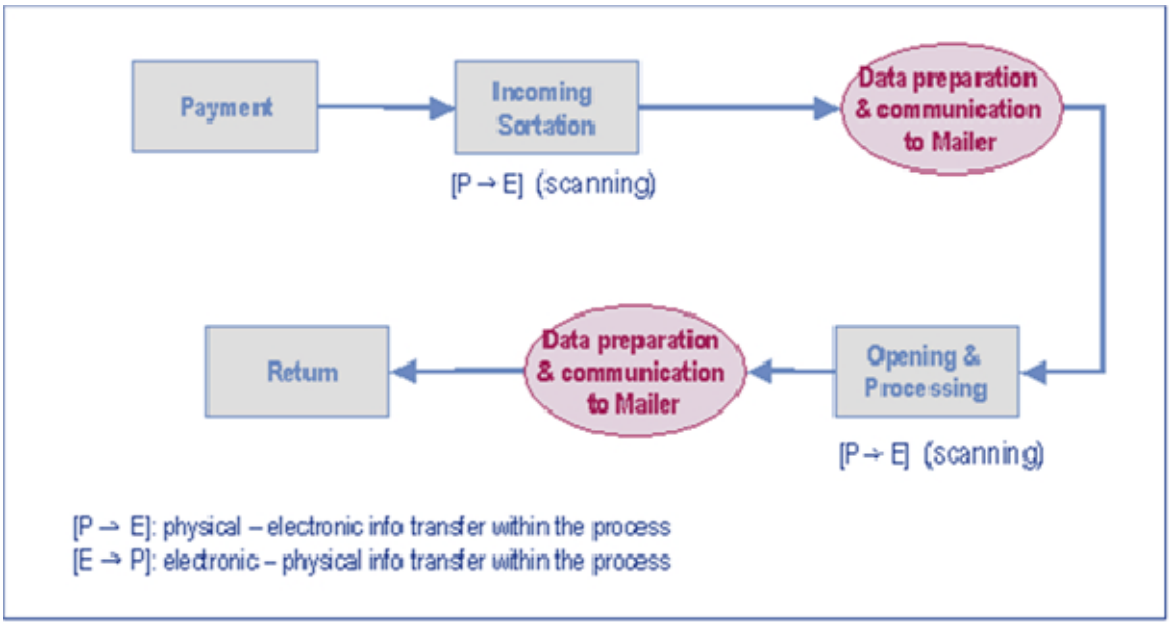

Figure 5 – Recipient domain process

4.5.3.1 Payment

After-delivery, payment usually concerns either business reply mail or Charge On Delivery (COD) mail units.

4.5.3.2 Incoming sortation

Incoming sortation is typically a manual process. In rare instances when incoming mail units are automatically sorted they are provided with additional information (such as internal mail stop), or the sorter has access to a database of mail recipients with their associated mail stops.

4.5.3.3 Opening and processing

In some instances mail openings and processings are performed automatically, for example when incoming mail units contain financial instruments such as checks (e.g. during remittance processing). All correspondence mail units are processed manually.

4.5.3.4 Return

When an incoming mail unit has an incorrect address or a recipient name and has been delivered by mistake, it is returned to the postal operator for exception processing. This process can trigger an error correction process that can result in generation and communication of computerised error correction information (see also 4.5.2.7).

4.6 Interfaces

Interfaces between mailer, recipient and postal domains are shown in Figure 1. All interfaces can be divided into two broad categories, namely interfaces that are enabled by physical mail units and electronic interfaces that are usually enabled by connecting computers in the mailer, recipient and postal domains through a private or public communication network (such as the internet).

Interfaces that make use of physical mail units are represented by the information printed or written directly on these mail units or attached to them via labels that are in turn either imprinted (machine printed) or inscribed with information (hand written). It is also possible to use specially designed electronic devices such as RF tags to exchange information between domains via mail units. In all cases, it is convenient to refer to the interface that is enabled by the mail units themselves as “material interface channel” or simply “material channel”.

Cost effective representation of information using mail units requires that information density should be sufficient to encode all application-required information for all classes of mail units, all business applications and all postal products. This should be accomplished for a broad variety of printing substrates. Effective automated capture of the information off mail units implies reliable scanning and interpretation of the data present on said mail units.

It should be noted that electronic interfaces between domains could be implemented not only via electronic public communication networks such as internet but also through portable electronic media such as magnetic disks, CD/DVD memories and flash memory. Electronic interfaces can be passive or active. A passive interface can be exemplified by a service provider (e.g. a postal operator) that allows access to information via a web service using browser software. An active interface can be exemplified by the direct transfer of information between domains using for example e-mail or FTP protocol when information is delivered to an explicitly identified recipient’s computer. The electronic interface channel is becoming an increasingly important aspect of the mail communication system by enabling true integration of the entire mail communication network.

Specific protocols, message content and structure are outside of the scope of a present standard. They are addressed in UPU and CEN standards dedicated to specific important applications (e.g. statement of mailing submission) and listed in the bibliography. This document defines only a generic term of electronically exchanged message in order to address issues related to all such messages, for example, security services (authentication, data integrity, privacy and no-repudiation).

NOTE 1 Although hand written information (such as address data) is frequently encountered in mail communication and can also be considered as a part of material interface it is typically not suitable for effective exchange of information between domains and therefore excluded from the description above.

NOTE 2 Electronic interface between domains can also be implemented via portable electronic media such as magnetic disks, CD/DVD memories and flash memory. However, these interfaces are less effective and becoming increasingly unpopular.

5 Customer-directed information (model of usage)

This clause describes observations that can be taken within the postal domain process, particularly observations that contain useful information for the customers. It should be stressed that the set of observation points within the postal process described in this clause are not intended to be complete. These observation points are selected as representative examples of such points within the postal domain where information that can be collected is deemed to be particularly relevant to customer needs. In this the customers are understood as any suitable party within the mailer or recipient domain. Since the most likely beneficiary of the observation information is the mailer, unless specified otherwise, the word *customer* will be understood to mean the appropriate party within the mailer domain. When the recipient is also a beneficiary it is mentioned explicitly.

The diagram in Figure 6 provides a useful mechanism to determine points within the postal domain process where observations valuable to customers could be taken. These observations are described by a set of mail unit attribute values, knowledge of which in turn, could be important to customers. All observations described here are related to a single mail unit.

The clause is organized as follows:

— point within a postal domain process is chosen and described;

— list of mail unit attributes that need to be observed at this point is provided and the significance to customers of knowing the value of these attributes is explained.

The diagram in Figure 6 is the diagram from Figure 4, Postal processes, with the addition of the seven observation points described in 5.3.1 to 5.3.7 of this document.

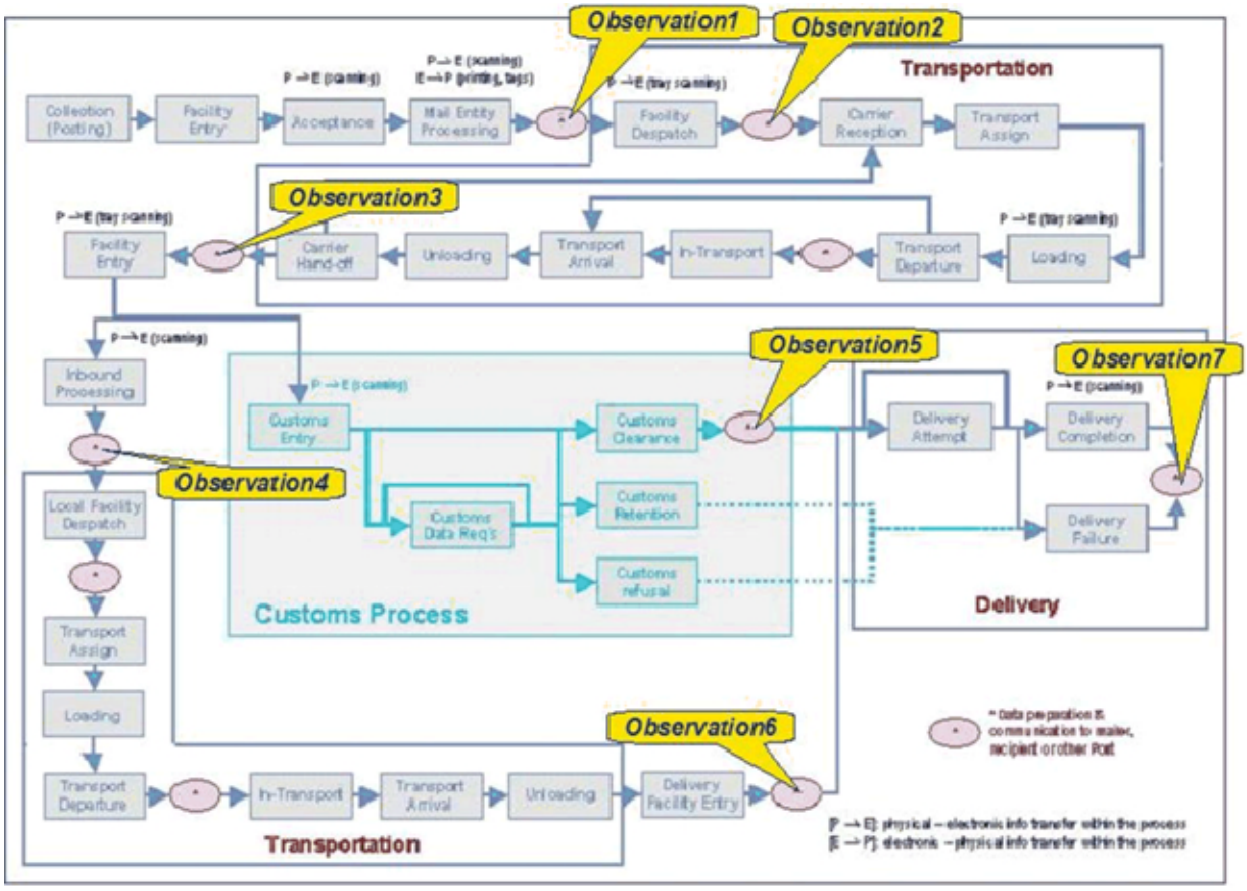

Figure 6 – Postal processes and observation points

5.1 Observations

5.1.1 Observation at outbound facility

During outbound mail processing mail unit information is captured, for example a digital image of the mail unit is produced and analysed. Areas of interest such as destination address block (DAB), digital postage mark (DPM), routing code and origination address are located. Furthermore, each area of interest is parsed, processed and converted into actionable information. For the purpose of this report, the information important for the customer that is captured during outbound mail processing concerns technical defects of mail unit and the location of the processing centre.

Observation1 (observation at outbound mail processing) comprises the values of mail unit attributes included the following list and obtained at the date of the outbound processing (*date1)*:

Table 1

Mail unit attribute	Comments
mailunit.Post-Applied-ID	At least one mail unit ID is necessary, the customer applied ID is more useful for the mailer
mailunit.Customer-Applied-ID	
mailunit.location	The value of this attribute is always captured/computed
mailunit.process	The value of this attribute is always captured/computed
mailunit.status	The value of this attribute is always captured/computed
mailunit.image	The image of the face of the mail unit

As a result of the processing the mail unit image, values of additional attributes are computed:

Table 2

Mail unit attribute	Comments
mailunit.DAB-image	DAB is Destination Address Block
mailunit.DAB-position	Position of DAB in relative to a given reference point
mailunit.DAB-dimensions	Dimensions of the DAB
mailunit.DAB-parsed-elements	Name, street, city, …
mailunit.DAB-skew	The angle of the DAB orientation in reference to the bottom of the envelope
mailunit.DAB-line-spacing	The smallest distance between lines in the DAB
mailunit.DAB-character-size	Minimum character size in the printed image
mailunit.DPM-image	Image of the Digital Post Mark in agreed upon format
mailunit.DPM-position	Position of DPM in relative to a given reference point
mailunit.DPM-dimensions	Dimensions of the DPM
mailunit.DPM-parsed-elements	Franking machine ID, postage value, date, …

5.1.2 Observation at outbound facility dispatch

At the time of the dispatch at the outbound facility the information that is captured and relevant to the customer needs is primarily tracking information. In particular, the knowledge of the date and location (when and where) the mail item left the outbound mail processing facility provides important input to business processes in the mailer and recipient domains. This can be achieved by using mail unit attribute *mailunit.process* indicative of the completion of a given process referenced by a code from a code list. In this case, completion of the loading process is captured by the value of the attribute *mailunit.process* at the *date2*.

Observation2 (observation at outbound facility dispatch) comprises the values for the following list and obtained at the date of outbound facility dispatch (*date2)*:

Table 3

Mail unit attributes	Comments
mailunit.Post-Applied-ID	At least one mail unit ID is necessary, the customer applied ID is more useful for the mailer
mailunit.Customer-Applied-ID	
mailunit.location	The value of this attribute is always captured/computed
mailunit.process	The value of this attribute is always captured/computed
mailunit.status	The value of this attribute is always captured/computed

5.1.3 Observation at inbound facility entry

At the time of entry into the inbound facility the information that is captured and relevant to the customer needs is tracking information. In particular, the knowledge of the date and location (when and where) the mail item arrived at the inbound mail processing facility provides important input to business processes in the mailer and recipient's domains. For example, frequently used customer relationship management (CRM) process can clearly benefit from the information indicative of the entry into the inbound processing facility (date and location) which is also indicative of the end of the end of the first transportation process.

Observation3 (observation at inbound facility entry) comprises the values for the following list and is obtained at the date of inbound facility entry (*date3)*:

Table 4

Mail unit attributes	Comments
mailunit.Post-Applied-ID	At least one mail unit ID is necessary, the customer applied ID is more useful for the mailer
mailunit.Customer-Applied-ID	
mailunit.location	The value of this attribute is always captured/computed
mailunit.process	The value of this attribute is always captured/computed
mailunit.status	The value of this attribute is always captured/computed

5.1.4 Observation at inbound facility processing

As described in 5.1.1, during outbound mail processing mail unit information is captured, for example, a digital image of the mail unit is produced and analysed. Areas of interest such as; destination address block, DPM, routing code and origination address are located. Furthermore, each area of interest is parsed, processed and converted into actionable information.

It is assumed that the information that has been captured at the outbound processing facility is shared with the inbound mail processing facility (this is frequently referred to as video encoding system). If this is not the case, then the same information can be captured at the inbound processing facility. Sometimes, the process at the inbound facility has access to additional information that is not easily available at the outbound facility (for example, clarifying information concerning a destination address that is local to the inbound process facility). This could be, for example, address correction information such as; correction to street range, street name, various prefixes and suffixes related to street names. In this case, observations at the inbound facility can provide further information concerning defects of mail unit (in particular, semantic defects) that are above and beyond the print image formation defects that were already described in 5.1.1. If, on the other hand, there is no additional information concerning mail unit data that has already been captured and processed at the outbound processing facility process, then the only useful additional information is the tracking information (as described in 5.1.2 and 5.1.3).

For the purpose of this report, the important information that is captured during inbound mail processing concerns its location and semantic defects of mail unit information.

Observation4 (observation at inbound facility processing) comprises the values for the following list and obtained at the date of inbound facility processing (*date4)*:

Table 5

Mail unit attributes	Comments
mailunit.Post-Applied-ID	At least one mail unit ID is necessary, the customer applied ID is more useful for the mailer
mailunit.Customer-Applied-ID	
mailunit.location	The value of this attribute is always captured/computed
mailunit.process	The value of this attribute is always captured/computed
mailunit.status	The value of this attribute is always captured/computed
mailunit.DAB-parsed-elements	Name, street, city, …
mailunit.DAB-address-text-corrected	Name, street, city, … after verification and correction using a database of valid addresses

5.1.5 Observation at customs

At the time of customs exit, there are several possible outcomes for the mail unit that is being observed.

If the mail unit cleared the customs, it can either proceed towards delivery without any further information requirements or it can require payment of assessed dues. If the mail unit was retained, it can require additional information before the mail unit is cleared. The mail unit can also be permanently confiscated. It is also possible that if the mail unit is refused entrance, it has to be returned to the sender or destroyed. The table below contains a list of mail unit attributes capable of describing major outcomes of the customs process.

Observation5 (observation at customs process) comprises the values for the following list and obtained at the date of customs processing (*date5)*:

Table 6

Mail unit attributes	Comments
mailunit.Post-Applied-ID	At least one mail unit ID is necessary, the customer applied ID is more useful for the mailer
mailunit.Customer-Applied-ID	
mailunit.location	The value of this attribute is always captured/computed
mailunit.process	The value of this attribute is always captured/computed
mailunit.status	The value of this attribute is always captured/computed
mailunit.dutiable-indicator	Indicates if the mail unit is subject to customs dues
mailunit.duty-charging-arrangements	Duty and tax payment method applicable to the mail unit
mailunit.treatment-customs	Treatment applied by the Customs to the goods which are subject to customs control, expressed as a coded value
mailunit.customs-requested-information	Free text

5.1.6 Observation at delivery facility entry

At the time of entry into the delivery facility the information that is captured and relevant to the customer needs is tracking information. In particular, the knowledge of the date and location (when and where) the mail item entered the delivery facility provides important input to business processes in the mailer and recipient's domains. For example, frequently used customer relationship management (CRM) process can clearly benefit from the information indicative of the entrance into the delivery facility (date and location).

Observation6 (observation at delivery facility entry) comprises the values for the following list and obtained at the date of delivery facility entry (*date6)*:

Table 7

Mail unit attributes	Comments
mailunit.Post-Applied-ID	At least one mail unit ID is necessary, the customer applied ID is more useful for the mailer
mailunit.Customer-Applied-ID	
mailunit.location	The value of this attribute is always captured/computed
mailunit.process	The value of this attribute is always captured/computed
mailunit.status	The value of this attribute is always captured/computed

5.1.7 Observation at delivery to recipient

At the time of delivery, there are several possible outcomes. In most cases, the mail unit is successfully delivered without any further request or supply of additional information; in that case the location of delivery is the only significant mail unit attribute value of which is worth knowing. If a proof of delivery is requested, than there should be a mail unit attribute value of which is the image of the recipient's signature. In case of delivery failure, mail unit attributes should provide information about attempt(s) made to deliver and the final disposition of the mail unit.

Observation7 (observation at delivery to recipient) comprises the values for the following mail unit attributes obtained at the date of delivery to recipient (*date7)*:

Table 8

Mail unit attributes	Comments
mailunit.Post-Applied-ID	At least one mail unit ID is necessary, the customer applied ID is more useful for the mailer
mailunit.Customer-Applied-ID	
mailunit.location	The value of this attribute is always captured/computed
mailunit.process	The value of this attribute is always captured/computed
mailunit.status	The value of this attribute is always captured/computed
mailunit.delivery-completion	Variable indicative of successful delivery at the delivery date
mailunit.delivery-failure	Variable indicative of failure to deliver
mailunit.post-determined-non-delivery-disposition	Outcome of posts' actions to be communicated to the mailer
mailunit.actual-proof-of-delivery	Image of recipient's signature
mailunit.delivery-last-attempt	Sequential integer value representing the last delivery attempt

5.2 Expectation

As defined, an expectation is a set of mail unit attribute values predicted at a future date. A simple example is the value of the mail unit location at a given date in the future. This clause illustrates the structure of an expectation.

The description of the most used postal products creates an expectation regarding the timing of mail unit delivery. The mailer expects delivery within a date range, based on the postal product used. There are many communications applications when mailers have stricter requirements with regard to delivery timing. A well-known example is express mail. Regardless of the mail product being used, the mailer might want to express expectations concerning the timing of delivery using the mechanism of expectations. The following table exemplifies one way of doing so.

In the table below, *date1* is a future date, or date range, when the mailer expects completion of delivery of the mail unit.

Expectation1 (expectation at delivery to recipient) comprises the values for the following list of mail unit attributes within a date or date range (*date1)*:

Table 9

Mail unit attributes	Comments
mailunit.Post-Applied-ID	At least one mail unit ID is necessary, the customer applied ID is more useful for the mailer
mailunit.Customer-Applied-ID	
mailunit.location	The value of this attribute is always captured/computed
mailunit.delivery-completion	Variable indicative of successful delivery at the delivery date
mailunit.actual-proof-of-delivery	Image of recipient's signature

5.3 Events

As defined, an event is an occurrence of a significant change between any two observations (regular event) or occurrence of a significant deviation between an observation and an expectation (exceptional event). Events are computed from observations/expectations and postal product attributes (rules and thresholds) stored as event attribute values.

This clause describes events computed from the observations and expectation detailed in 5.1 and 5.2. The mail unit attributes captured in the observations/expectation and the event attributes are included in the message triggered by the event and sent to the customer.

The following XML schema demonstrates the formal structure of event information. This is the core of the communication message that is sent to the customer as a result of an event.

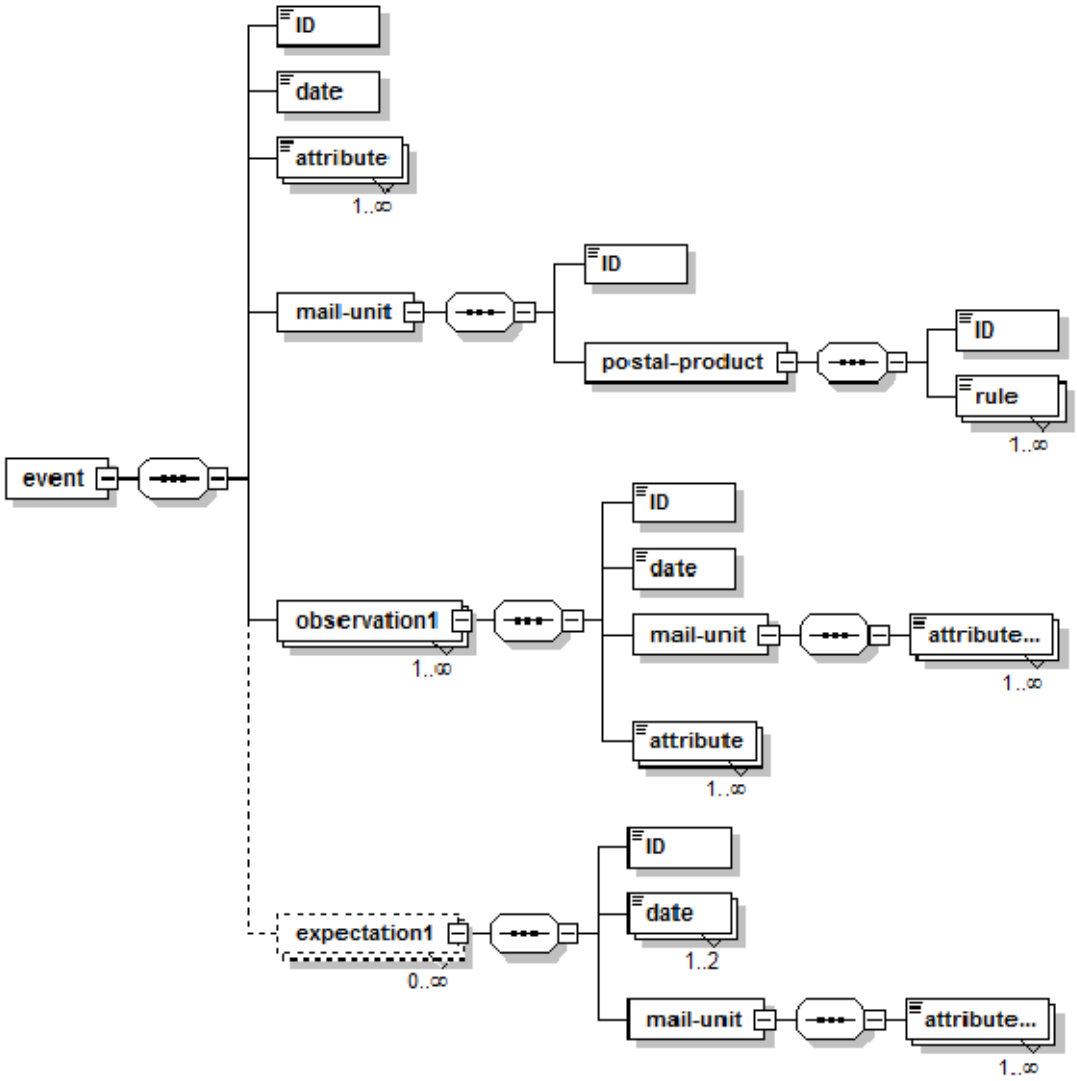

Figure 7 – Generic structure of event information

5.3.1 Event at outbound facility

Values of several mail unit attributes change as a result of processing at the outbound mail processing facility. For example, since *Observation1* is the first observation, the location attribute of the mail unit changes from its previous value (that could be NULL or the location of the induction point that is formally designated as *Observation0*) to the value indicative of the location of the outbound mail processing facility. The occurrence of this change is an event that triggers a communication of tracking information to the customer, assuming that the occurred change is deemed to be significant.

Furthermore, detection of technical defects of the mail unit image following the mail scanning process can generate the occurrence of another event, providing that the occurred change exceeds the threshold specified by postal regulations. This event triggers communication of defect information to the mail creator. This information can be used to correct possible deficiencies of the mail creation process.

The following table illustrates conditions that lead to the events described above:

Table 10

Mail unit attributes	Condition	Reference value
mailunit.location	Different than	Location captured in previous observation (or NULL)
mailunit.process	Different than	Process code captured in previous observation
mailunit.DAB-skew	Greater than	acceptable skew (as specified by postal regulations)

The following XML schema illustrates the structure of the core information sent to the customer:

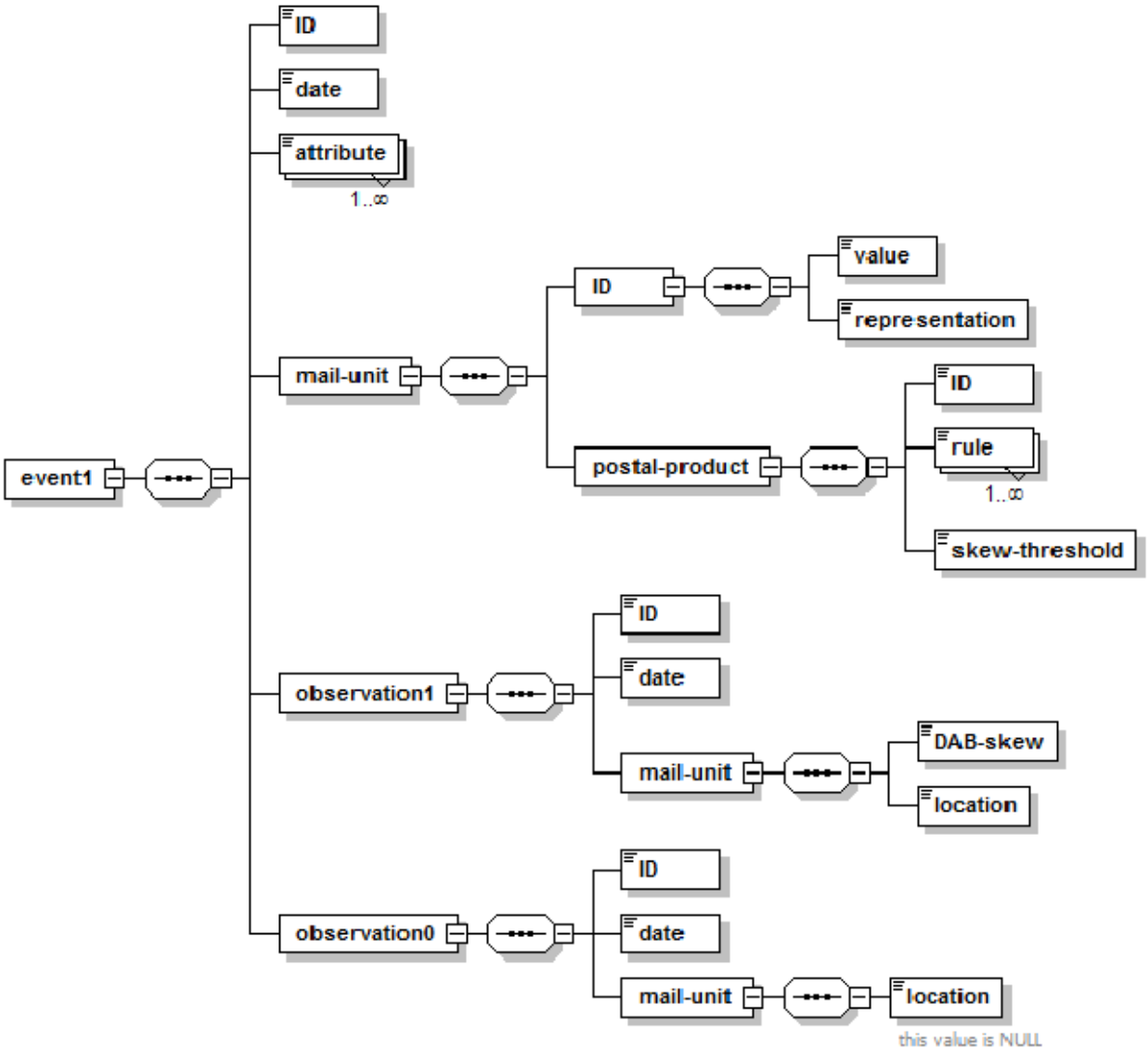

Figure 8 – Structure of the core information sent to customer triggered by *Event1*

For the sake of brevity and clarity, the schema in Figure 8 does not include the mail unit attributes listed in 5.1.1 that do not experience a change at *Date1*.

5.3.2 Event at outbound facility dispatch

The value of the *mailunit.process* attribute changes from its previous value (e.g. “sorting”) to the current value (e.g. “loading”). The occurrence of this change is an event that triggers a communication of tracking information (indicative of the beginning of a transportation process) to the customer, assuming that the occurred change is deemed to be significant.

The following table illustrates conditions that lead to the events described above:

Table 11

Mail unit attributes	Condition	Reference value
mailunit.location	Different than	Location captured in previous observation (or NULL)
mailunit.process	Different than	Process code captured in previous observation

The knowledge of combined values of location and process attributes delivers important information for tracking.

The following XML schema illustrates the structure of the core information sent to the customer:

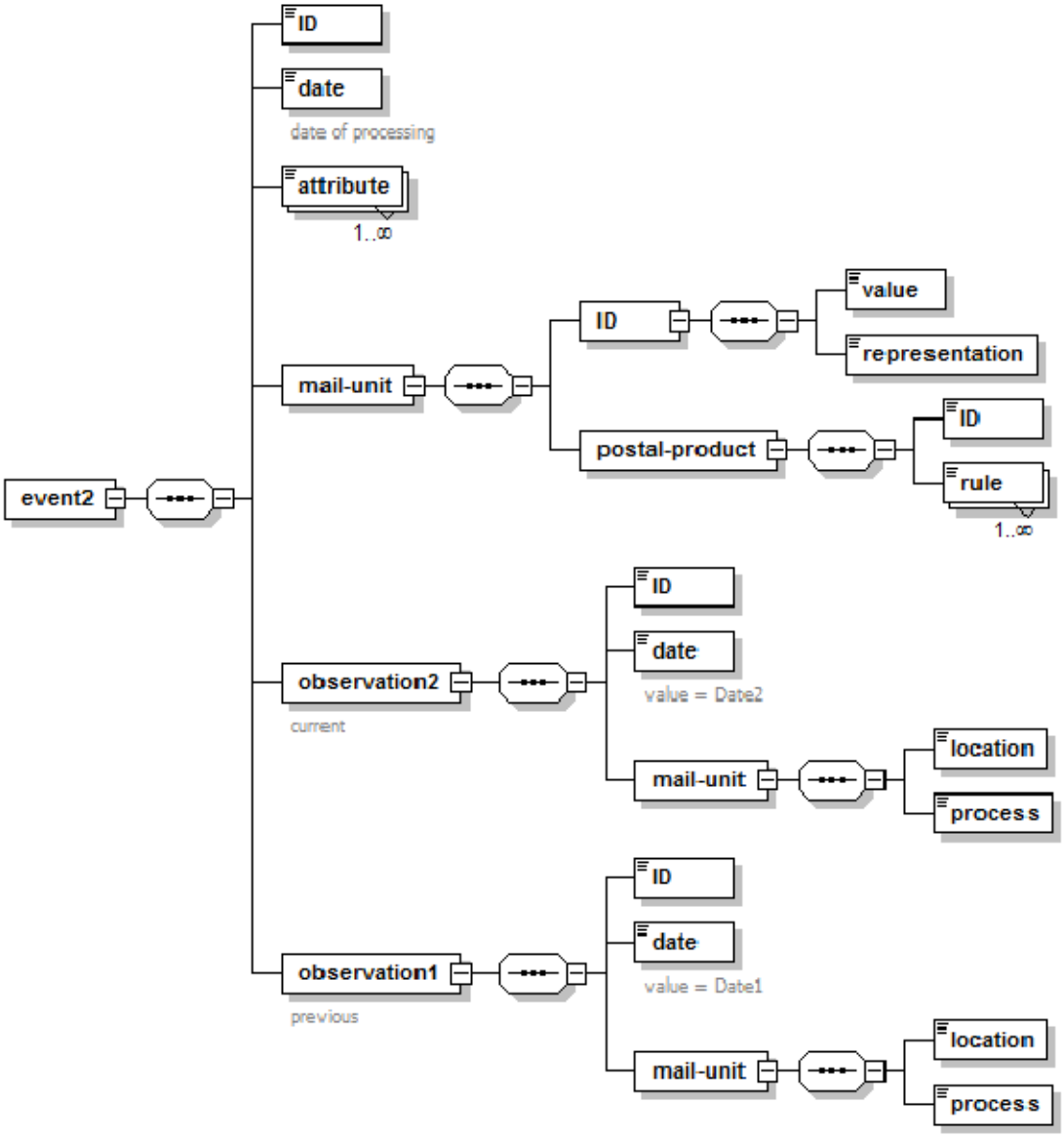

Figure 9 – Structure of the core information sent to customer triggered by *Event2*

For the sake of brevity and clarity, the schema in Figure 9 does not include the mail unit attributes listed in 5.1.2 that do not experience a change at *Date2*.

5.3.3 Event at inbound facility entry

At the entry to the inbound processing facility the value of *mailunit.location* attribute changes from its previous value to the value indicative of the location of the inbound mail processing facility. The occurrence of this change is an event that triggers a communication of tracking information to the customer, assuming that the occurred change is deemed to be significant.

The following table illustrates conditions that lead to the events described above:

Table 12

Mail unit attributes	Condition	Reference value
mailunit.location	Different than	Location captured in previous observation (or NULL)
mailunit.process	Different than	Process code captured in previous observation

The following XML schema illustrates the structure of the core information sent to the customer:

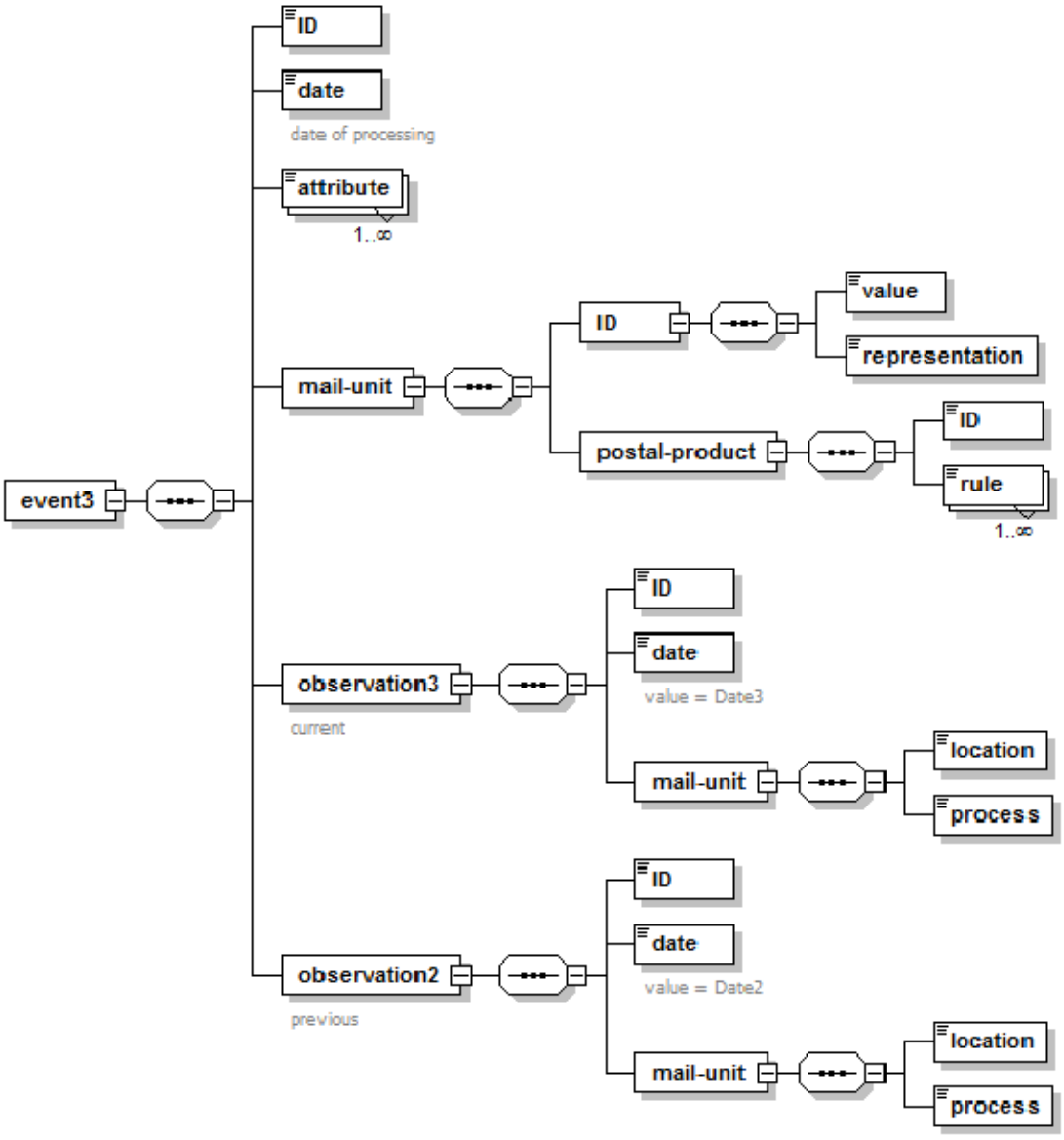

Figure 10 – Structure of the core information sent to customer that is triggered by *Event3*

For the sake of brevity and clarity, the schema in Figure 10 does not include the mail unit attributes listed in 5.1.3 that do not experience a change at *Date3*.

5.3.4 Event at inbound facility processing

Values of several mail unit attributes change as a result of processing at the inbound mail processing facility. First, *Observation4* contains the value of the location attribute that changes from its previous value to the value indicative of the location of the inbound mail processing facility. The occurrence of this change is an event that triggers a communication of tracking information to the customer, assuming that the occurred change is deemed to be significant.

Additionally, the detection of semantic defects of the mail unit address following the mail sorting process can generate an occurrence of another event indicative of a discrepancy between the address information present in the mail unit and canonical address information residing in a standardised address database. This event triggers communication of semantic defects to the mail creator. This information can be used to correct possible deficiencies of the mail creation process.

The following table illustrates conditions that lead to the events described above:

Table 13

Mail unit attributes	Condition	Reference value
mailunit.location	Different than	Location captured in previous observation (or NULL)
mailunit.process	Different than	Process code captured in previous observation
mailunit.DAB-parsed-elements	Different than	Name, street, city, … in standardised address database

The following XML schema illustrates the structure of the core information sent to the customer:

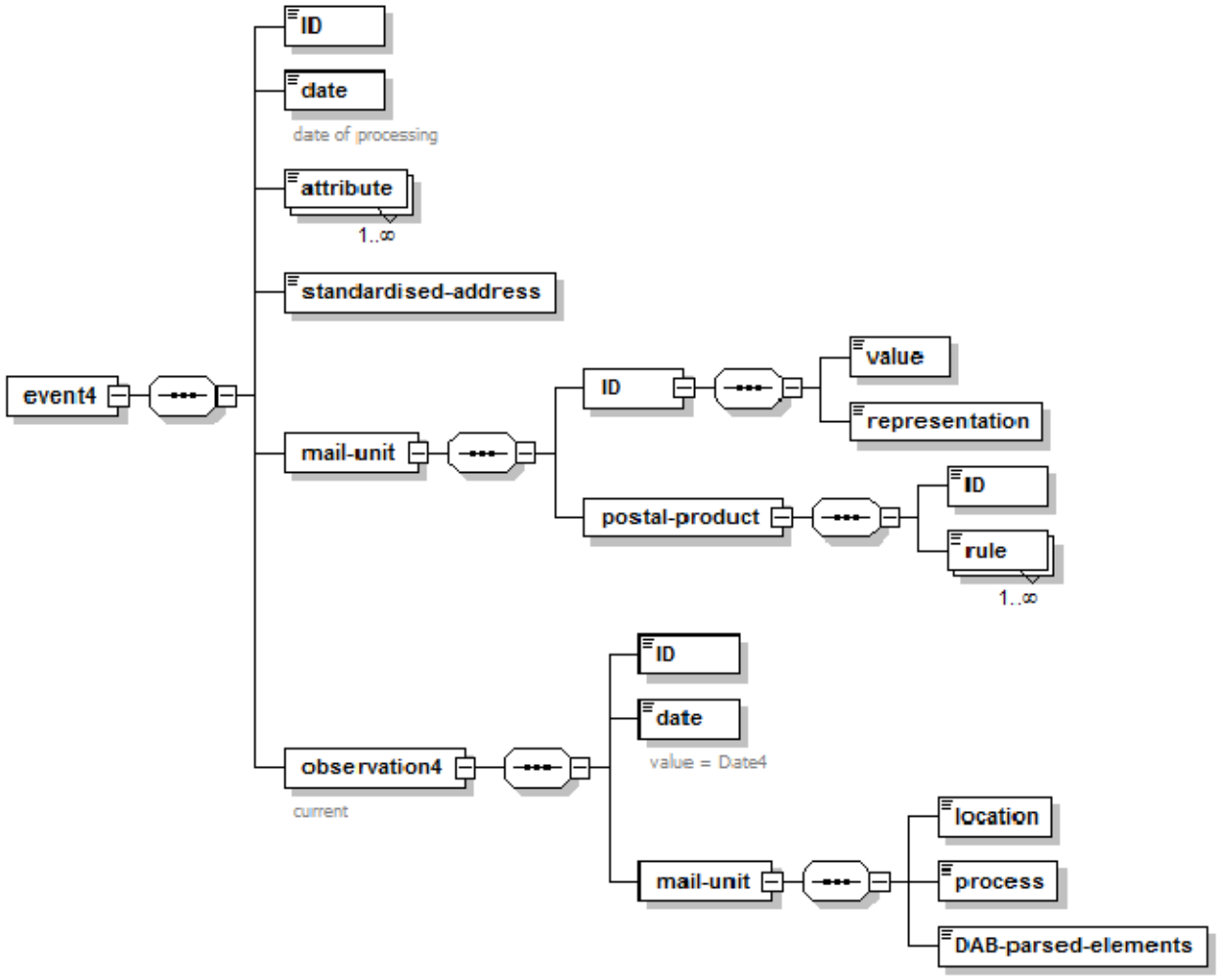

Figure 11 – Structure of the core information sent to customer triggered by *Event4*

For the sake of brevity and clarity, the schema in Figure 11 does not include the mail unit attributes listed in 5.1.4 that do not experience a change at *Date4*.

5.3.5 Event at customs

At the exit of the customs process the value of *mailunit.location* attribute changes from its previous value to the value indicative of the location of the customs facility. The occurrence of this change is an event that triggers a communication of tracking information to the customer, assuming that the occurred change is deemed to be significant.

Additionally, several other attributes gain new values. These are:

— mailunit.dutiable-indicator;

— mailunit.duty-charging-arrangements;

— mailunit.treatment-customs;

— mailunit.customs-requested-information.

The following table illustrates conditions that lead to the events described above:

Table 14

Mail unit attributes	Condition	Reference value
mailunit.location	Different than	Location captured in previous observation (or NULL)
mailunit.process	Different than	Process code captured in previous observation
mailunit.dutiable-indicator	Equal to	“true”
mailunit.duty-charging-arrangements	Different than	NULL
mailunit.treatment-customs	Different than	NULL
mailunit.customs-requested-information	Different than	NULL

The following XML schema illustrates the structure of the core information sent to the customer:

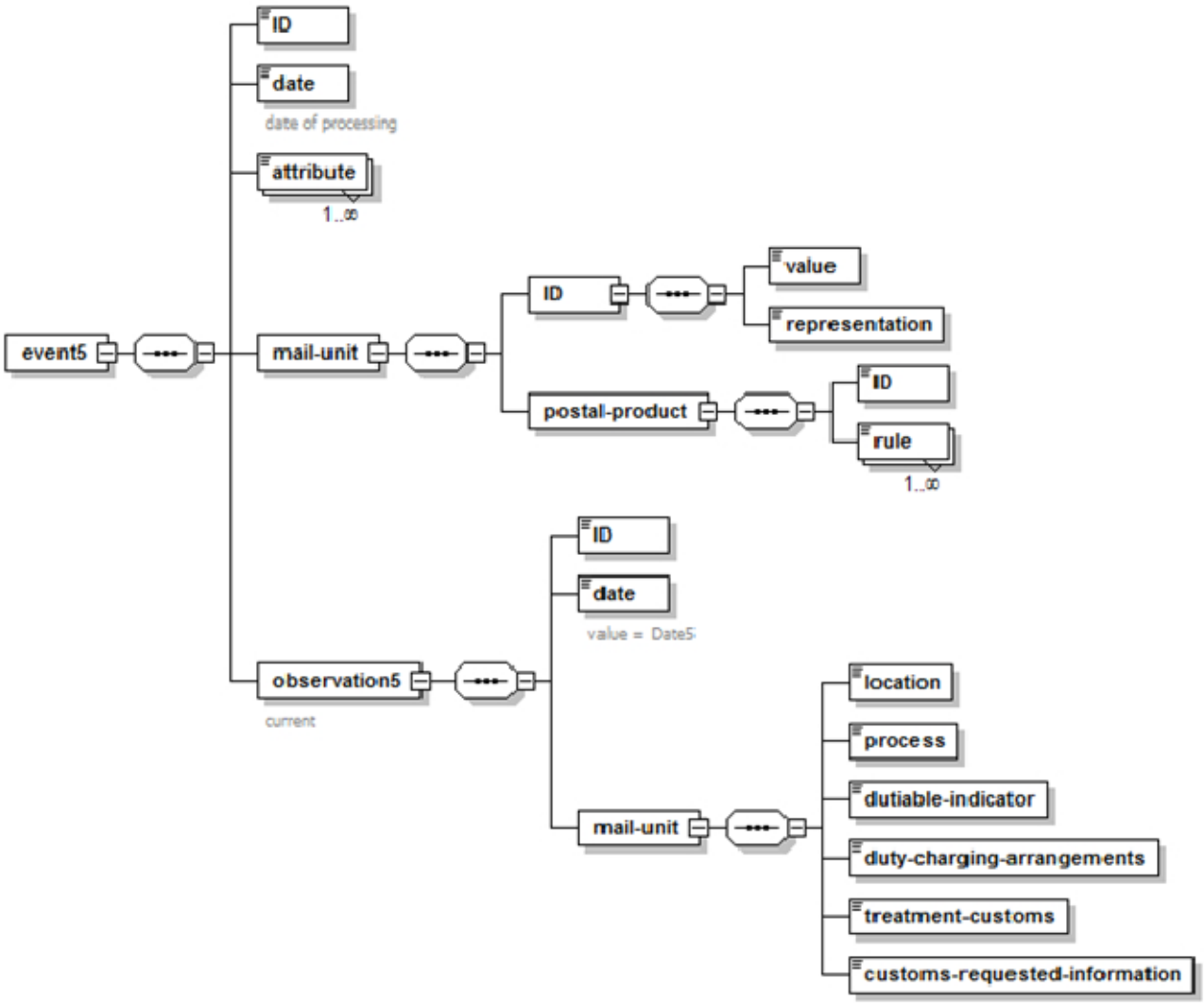

Figure 12 – Structure of the core information sent to customer triggered by *Event5*

For the sake of brevity and clarity, the schema in Figure 12 does not include the mail unit attributes listed in 5.1.5 that do not experience a change at *Date5*.

5.3.6 Event at delivery facility entry

At the entry to the delivery facility the value of *mailunit.location* attribute changes from its previous value to the value indicative of the location of the delivery facility. The occurrence of this change is an event that triggers a communication of tracking information to the customer, assuming that the occurred change is deemed to be significant.

The following table illustrates conditions that lead to the events described above:

Table 15

Mail unit attributes	Condition	Reference value
mailunit.location	Different than	Location captured in previous observation (or NULL)
mailunit.process	Different than	Process code captured in previous observation

The following XML schema illustrates the structure of the core information sent to the customer:

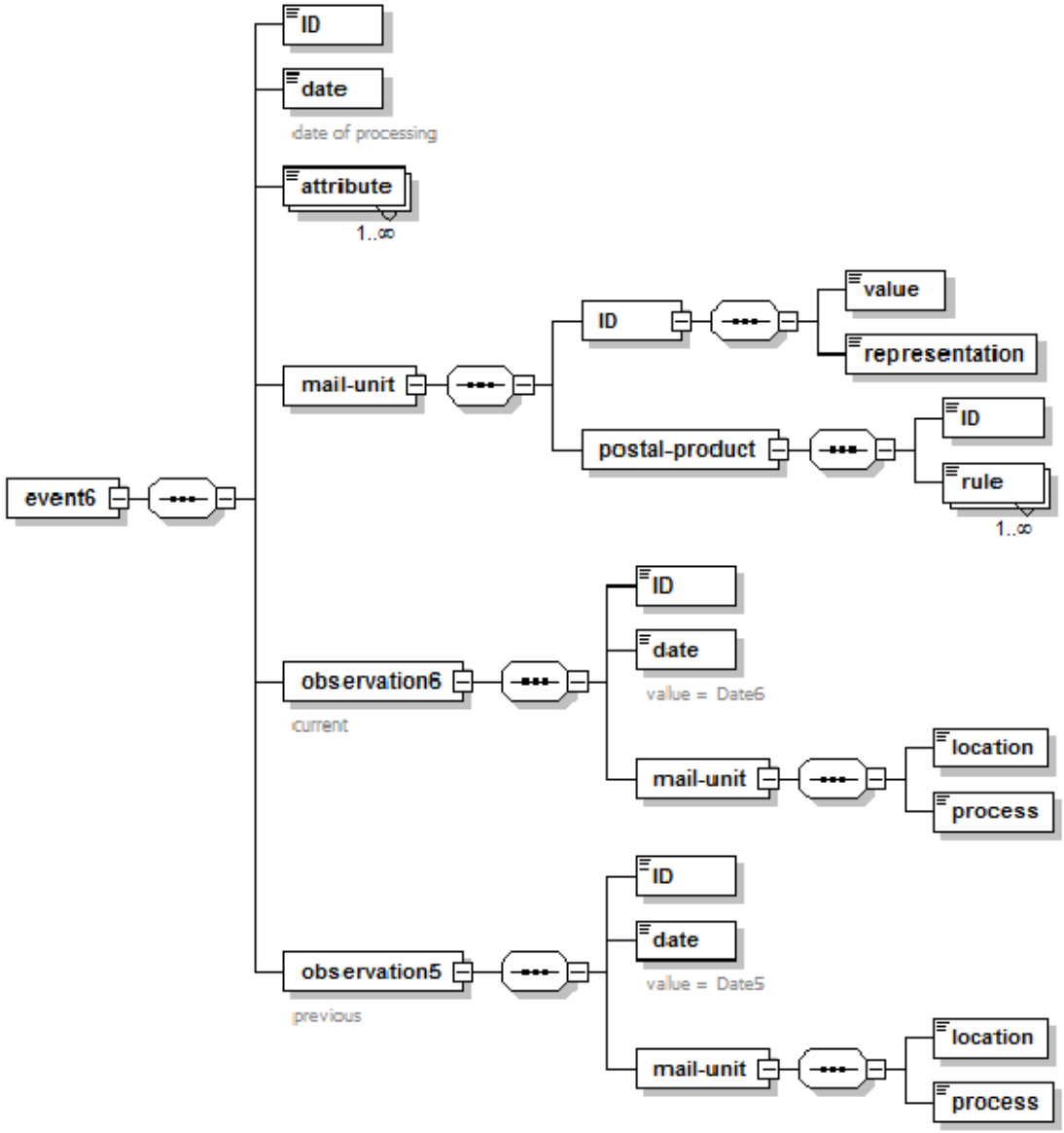

Figure 13 – Structure of the core information sent to customer triggered by *Event6*

For the sake of brevity and clarity, the schema in Figure 13 does not include the mail unit attributes listed in 5.1.6 that do not experience a change at *Date6*.

5.3.7 Event at delivery to recipient

At the end of the delivery process the value of *mailunit.location* attribute changes from its previous value to the value indicative of the delivery location. The occurrence of this change is an event that triggers a communication of tracking information to the customer, assuming that the occurred change is deemed to be significant.

Additionally, several other attributes gain new values. These are:

— mailunit.delivery-completion;

— mailunit.delivery-failure;

— mailunit.post-determined-non-delivery-disposition;

— mailunit.actual-proof-of-delivery;

— mailunit.delivery-last-attempt.

The following table illustrates conditions that lead to the events described above:

Table 16

Mail unit attributes	Condition	Reference value
mailunit.location	Different than	Location captured in previous observation (or NULL)
mailunit.process	Different than	Process code captured in previous observation
mailunit.delivery-completion	Different than	NULL
mailunit.delivery-failure	Different than	NULL
mailunit.post-determined-non-delivery-disposition	Different than	NULL
mailunit.actual-proof-of-delivery	Different than	NULL
mailunit.delivery-last-attempt	Different than	NULL

The following XML schema illustrates the structure of the core information sent to the customer:

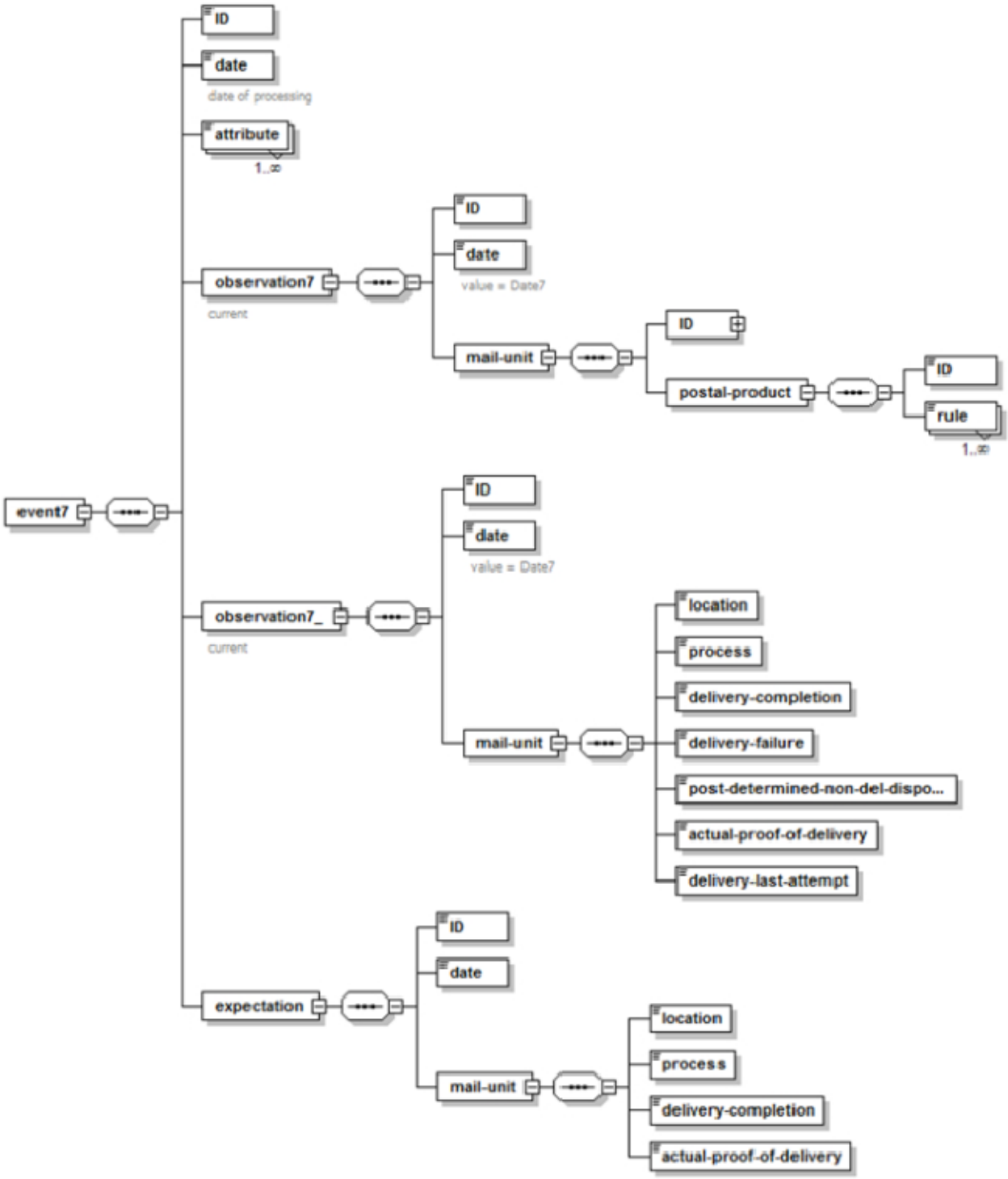

Figure 14 – Structure of the core information sent to customer triggered by *Event7*

For the sake of brevity and clarity, the schema in Figure 14 does not include the mail unit attributes listed in 5.1.7 that do not experience a change at *Date7*.

5.4 Track and trace

When track and trace is the only application for customer directed information gathering and communication, the two relevant mail unit attributes are *mailunit.location* and *mailunit.process*. The values of these attributes at selected process points provide complementary information that in its totality represents a full set of tracking information. This information can be useful to the mail unit recipient as well as its sender.

Table 17

Observation	Value of mailunit.location	Value of mailunit.process
Observation1 at outbound facility	location1	process-code1
Observation2 at outbound facility dispatch	location2	process-code2
Observation3 at inbound facility entry	location3	process-code3
Observation4 at inbound facility processing	location4	process-code4
Observation5 at customs	location5	process-code5
Observation6 at delivery facility entry	location6	process-code6
Observation7 at delivery to recipient	location7	process-code7

6 List of mail unit attributes and corresponding events

This clause provides a list of mail unit attributes and events that occur in the postal domain when the values of these attributes change in a significant way [see detailed discussion of the concepts and the meaning of “significance” in 4.4.12]. The entries in the list are selected based on their “usefulness” for the customers. It should be stressed that the list is not intended to be complete and rather serves as an illustrative purpose. The list reflects the current state of the knowledge of customer applications that are the main “consumers” of information created in the postal domain. It is expected that future implementation of a fully integrated mail communication system with rich exchanges of information between end users and postal operators will generate many more attributes and events that will be added to the list as the experience in designing and operating integrated systems grows. It also should be stressed that the list in this clause is generic in nature and in no way is intended to represent a specific postal operator, a specific postal domain or a specific set of end users. The list is a living one and it is also expected that some of the entries in the list can prove to be less valuable in practical applications and can later be removed from the list altogether.

Thus, the main purpose of this clause is twofold:

1) enable a clear understanding on the part of the reader of the methodology used in selecting mail unit attributes suitable for capturing information valuable to customers;

2) demonstrate how selected attributes create events that store such information.

It should be noted that some attributes that are listed as mail item attributes in UPU M33 standard are omitted from the table below. These attributes in the context of the present specification and its complement, Part A, are event attributes that are captured as such. For example, the mail-item.latest-delivery-time (UPU M33 section 7.45) or mail-item.handling-constraints are captured as event attributes where they originate from the postal product attributes.

The remainder of the clause explains the basic criteria (a set of considerations) that have been used in selecting mail unit attributes (and events) for the list and provides the list itself.

It has been assumed that customers (both senders and recipients) are generally interested in two basic sets of events, namely events (and all associated information) related to successful completion of key processes and events related to exceptions and exceptions processing.

The information contained in structures linked to the former set of events enables senders and recipients to schedule their activities that are dependent on mail communications. One important example in this category is CRM (customer relationship management) when business applications (e.g. accounts receivable) would want to have (preferably computerised) information about all mail units that are addressed to them and are in transit within the postal domain in order to avoid costly and annoying calls reminding debtors about unpaid obligations. In this case traditional track and trace systems that enable the capture and communication of information about locations of mail units within the postal domain are sufficient. In addition, events related to mail handover between postal processes or between postal administrations clearly could be of interest to customers.

The information related to exceptions and exception handling is more complex and could not be entirely predictable. Thus, information structures containing exception events should be flexible. Generally, exception processing in the postal domain resulting from activities and processes in the mailer domain is of great interest since it can be significantly reduced or entirely eliminated should mailers be made aware of their defective processes and of potential corrective actions (in particular, information that can be profitably used for such actions). This information provides a foundation for another set of events in the table that follows.

All attributes in the table generally fall into two categories. Firstly, attributes, values of which can possible change only once, typically from a NULL value to a fixed value that remains constant during the life of the mail unit. Secondly, attributes, values of which can continuously change from observation to observation. For the attributes in the first category, the value change from NULL to a fixed value creates an informational event that is not given a specific name in the table. Should this type of events require specific naming, this can be done in the context of applications where such naming could be required.

Table 18 – Mail unit attributes and corresponding events

Mail unit attributes and corresponding events					
Attribute Name	Attribute Definition	Comment	UPU M33	Event name	Comment
mailunit.Post-Applied-ID	unique identifier for the item, expressed in the form of an ISO/IEC 15459 licence plate.	mail unit's identity in the postal domain. It is used to reference the mail unit, and by extension observations, expectations and events associated with mail unit. Mail unit ID is a special attribute that is mandatory and must be unique within the context of a given application. mail unit ID must be known to customers. identifiers created within postal domain for internal use only are outside the scope of this specification.	7.37	application dependent	mailunit.Post-Applied-ID does not change after it has been assigned to a mail unit and as a result, there is only a change from NULL value to its assigned value. No other changes are expected.
mailunit.Customer-Applied-ID	unique identifier for the item, expressed in a form which is readable by post's equipment.	mail unit's identity in the customer's domain is used to reference the mail unit, and by extension observations, expectations and events associated with mail unit. Mail unit ID is a special attribute that is mandatory and must be unique within the context of a given application. Because this attribute value originates from the mailer domain, it is a priori known to the mailer (or its agents). However, for the integrity of the system, it could be important to capture this information within the postal domain and communicate it to the mailer for verification purpose.		application dependent	mailunit.Customer-Applied-ID does not change after it has been assigned to a mail unit and as a result, there is only a change from NULL value to its assigned value. No other changes are expected.

Table 18 *(continued)*

Mail unit attributes and corresponding events					
Attribute Name	Attribute Definition	Comment	UPU M33	Event name	Comment
mailunit.Post-Applied-ID.representation	specification of the manner in which a mail unit ID is physically represented on, or attached to, the item concerned, expressed as a representation symbology code from UPU codelist 130.	method of representation of the post-applied ID (for example, barcode symbology, OCR, RFID, and its data format).	7.38	application dependent	mailunit.Post-Applied-ID.representation does not change after it has been assigned to a mail unit and as a result, there is only a change from NULL value to its assigned value. No other changes are expected.
mailunit.Customer-Applied-ID.representation	specification of the manner in which a mail unit ID is physically represented on, or attached to, the item concerned, expressed as a representation symbology code from UPU codelist 130.	method of representation of the customer-applied ID (for example, barcode symbology, OCR, RFID, and its data format). Because this attribute value originates from the mailer domain, it is a priori known to the mailer (or its agents). However, for the integrity of the system, it could be important to capture this information within the postal domain and communicate it to the mailer for verification purpose.		application dependent	mailunit.Customer-Applied-ID.representation does not change after it has been assigned to a mail unit and as a result, there is only a change from NULL value to its assigned value. No other changes are expected.
mailunit.type	identifies the kind of mail unit, for example: tray, letter, postcard, sack, etc., expressed as a value from a codelist.	this information originates from the mailer domain and it is a priori known to the mailer. However, for the integrity of the system, it could be important to capture this information within the postal domain and communicate it to the sender for verification purpose.		application dependent	mailunit.type does not change after it has been created, there is only a change from NULL value to its proper value. No other changes are expected.

Table 18 *(continued)*

Mail unit attributes and corresponding events					
Attribute Name	Attribute Definition	Comment	UPU M33	Event name	Comment
mailunit.process	mail processing step the given mail unit is subjected to at the time of observation or at the expected time. It takes values from a code list.	the value of this attribute is derived from a code list of processes and their stages within postal domain such as; start-sorting, end-transportation, continue-holding. Examples of processes are: sorting, transport-tation, delivery, hand-over, creation of con-tent for the mail unit, extraction of content of mail unit for a business process, etc.		event.entity-process-change	when attribute item.process changes its value from 'start' to 'end' it defines the 'event.entity-process-change'.
mailunit.status	current state of the process (mailunit.process) as it applies to the given mail unit. It takes value from a code list. Examples are: successfully completed, failed, underway, delayed.	this variable takes a value from a code list of states of processes for the mail unit in terms of its arrival, stay, departure, etc. The use of this attribute complements the use of mailunit.process defined above.		event.entity-status-change	
mailunit.location	physical and/or logical location where the mail unit is subjected to the process identified by the attribute mailunit.process.	Mail unit location attribute can be expressed as 1) physical location (e.g. postal code, geographical code, postal addresses) or 2) indicator of a sub-location within specific physical location (e.g. sorting machine number 5, or loading dock number 7). Customers may chose to specify which form of expression they prefer for receiving location information.		event.entity-location-change	

Table 18 *(continued)*

Mail unit attributes and corresponding events					
Attribute Name	Attribute Definition	Comment	UPU M33	Event name	Comment
mailunit.condition	condition of the physical mail unit.	this attribute takes its value from a code list. Change of this attribute may indicate damage to the mail unit.		event.entity-condition-change	
mailunit.member-of-mailunit.ID	ID of the (higher level) mail unit which the given mail unit belongs to (when it is part of another mail unit).	is this attribute is described under the name "assigned-aggregate" in M33(?) For example, if the given mailunit is a tray, then the value of this attribute could be the ID of the rolling cage which contains this tray.		event.aggregation	it indicates both the process of including a mail unit into a larger one (when NULL value is replaced by the value of a specific ID) and break-up of the larger mail unit (when the value of a specific ID is replaced by NULL value).
mailunit.members-of-mailunit.type	type of mail units which are members of a given compound mail unit expressed as a value from a mailunit.type codelist.	use of this attribute is complementary to the use of mailunit.member-mailunit.cardinality attribute.		event.aggregation	
mailunit.member-mailunit.cardinality	number of member mail units of a given type contained in a compound mail unit.	use of this attribute is complementary to the use of mailunit.member-mailunit.type attribute.		event.aggregation	
mailunit.replied-to-item-ID	an identifier of the original mail unit which triggered the sending of the given mail unit by the recipient of the original mail unit (who assumes the role of the mailer).	this is the ID of the mail unit which triggered the sending of the BRM.		event.reply-item-ID-assigned	

Table 18 *(continued)*

Mail unit attributes and corresponding events					
Attribute Name	Attribute Definition	Comment	UPU M33	Event name	Comment
mailunit.custodian-party	party which has custody of the mail unit.	party that is responsible for the well being of the mail item; takes values from a code list.		event.entity-custodian-change	this information may be useful when postal operator makes use of contractors and there is a dispute between the mailer and the postal operator.
mailunit.Post-Applied-ID.Confidence-level	indication of the confidence level that the Post-Applied-ID of the mail unit was correctly read.	this for example could be measured by the number of error correction words used by the Post to recover the ID, when an identifier with error correction codewords is used.		event.ID-read-quality	indicates potential defects with either the mail unit or the postal equipment.
mailunit.Customer-Applied-ID.Confidence-level	indication of the confidence level that the Customer-Applied-ID of the mail unit was correctly read.	this for example could be measured by the number of error correction words used by the Post to recover the ID, when an identifier with error correction codewords is used.		event.ID-read-quality	indicates potential defects with either the mail unit or the postal equipment.
mailunit.replacement-delivery-address	modified delivery address for the item as determined by a postal handling organisation, characterised by its full specification.	if the post is the determining party for the replacement delivery address then both replacement-delivery-address and replacement-delivery-address-determining-party are recorded.	6.14	event.entity-post-changed-of-delivery-address	mail unit attribute value changes from delivery-address as specified on the item to replacement-delivery-address determined by the Post.
mailunit.replacement-delivery-address-reason	specification of the reason for modification of the delivery address for the item by a postal operator, expressed as a UPU codelist 135 value.	the value of this attribute, when determined by the postal operator, is important to the mailer and possibly to the recipient.	7.71	event.entity-post-changed-of-delivery-address-reason	

Table 18 *(continued)*

Mail unit attributes and corresponding events					
Attribute Name	Attribute Definition	Comment	UPU M33	Event name	Comment
mailunit.preferred-delivery-date	date, specified by the mailer, at which the mail unit should desirably be delivered.			event.delivery-date-preference-change	the value of this attribute can be communicated to the postal operator while the mail unit is in transit.
mailunit.delivery-latest-attempt	variable that takes sequential integer values representing the latest delivery attempt at the date of attempted delivery.			event.delivery-attempt	
mailunit.post-determined-non-delivery-disposition	outcome of postal operator actions taken with regard to the mail unit that cannot be delivered which is communicated to the mailer.	this attribute takes its value from a code list.		event.entity-nondelivery-disposition	
mailunit.proof-of-delivery	proof of delivery as obtained by the post.	for example a digital image of the recipient's signature.		event.entity-delivery	
mailunit.proof-of-delivery-description	description of proof of delivery as obtained by the post.	where the mailer allows multiple possible proofs of delivery, this attribute indicates which proof of delivery was obtained. For example the value of this attribute may indicate the role of the person who signed as a recipient (recipient, recipient member of the household, etc.).		event.entity-delivery	

Table 18 *(continued)*

Mail unit attributes and corresponding events					
Attribute Name	Attribute Definition	Comment	UPU M33	Event name	Comment
mailunit.measured-weight	weight of mail unit as measured by postal operator or recipient, expressed in agreed upon measurement units.	assumed to be measured by postal operator or recipient and has value to the mailer or recipient because the weight of the mail unit as measured by the mailer is by default known to the mailer.	7.50	event.entity-weight-change	
mailunit.dimensions	physical dimensions of the smallest cuboid which can completely enclose the item, expressed in agreed upon measurement units and arranged in descending order of their value.	assumed to be measured by postal operator or recipient and has value to the mailer or recipient because dimensions of the mail unit as measured by the mailer is by default known to the mailer.	7.25	event.entity-dimension-change	the value of this event lies in the fact that the enity dimensions change may be indicative of damage to the mail unit.
mailunit.content-type	identifies content for the purpose of classifying mailable matters in at least two categories: those that have perceived high value and returnable to the sender in case when they could not be delivered, and those that have lower (replacement) value and not returnable. - this attribute takes its value from a code list and could have assigned default value.	in some countries, there is a legal requirements to use only certain class of services for some communications.		event.content-classification	this event is used for determination of pricing.

Table 18 *(continued)*

Mail unit attributes and corresponding events					
Attribute Name	Attribute Definition	Comment	UPU M33	Event name	Comment
mailunit.dangerous-good.hazard-class	indication of whether the item is or has content that is classed as dangerous and, if so, of the nature of the danger expressed as the ICAO Hazard Class for the dangerous good concerned, taken from the IATA Dangerous Goods Regulations.	if determination of the dangerous goods hazard status and classification is made by the postal operator, then it needs to be reported to the mailer or recipient or both.	7.18	event.content-classification	this event is used for determination of handling.
mailunit.dangerous-good.type-code	indication of whether the item is or has content that is classed as dangerous and, if so, of the nature of the danger expressed as the UN No for the dangerous good concerned, taken from the Dangerous Goods List in Part 3 of the United Nations Recommendations on the Transport of Dangerous Goods.	if determination of the dangerous goods hazard status and classification is made by the postal operator, then it needs to be reported to the mailer or recipient or both.	7.19	event.content-classification	

Table 18 *(continued)*

Mail unit attributes and corresponding events					
Attribute Name	Attribute Definition	Comment	UPU M33	Event name	Comment
mailunit.postage-due	amount of unpaid postage to be collected from the mailunit.payer, expressed as an ISO 4217 currency code together with a numeric value, in that currency, that follows ISO 4217 currency rules regarding the number of decimal parts.	the value of this attribute is used when postal operator determines that the item requires additional postage.	7.63	event.entity-insufficient-postage	
mailunit.postage-refund	amount of postage overpaid to be refunded to the mailunit.payer.	the value of this attribute is used when (part of) postage is to be refunded to the postage payer.		event.entity-refund-postage	
mailunit.postage-due-on-delivery	amount of postage to be collected from the recipient prior to delivery, expressed as an ISO 4217 currency code together with a numeric value, in that currency, that follows ISO 4217 currency rules regarding the number of decimal parts.	needed to be communicated to the recipient, and maybe the mailer too.	7.64	event.entity-postage-due-on-delivery	
mailunit.customs-requested-information	free text	this attribute allows to communicate a request for additional information from a sender or recipient when needed.		event.customs-info-request	

Table 18 *(continued)*

Mail unit attributes and corresponding events					
Attribute Name	Attribute Definition	Comment	UPU M33	Event name	Comment
mailunit.dutiable-indicator	indication of whether the item is subject to customs dues, expressed as a UPU codelist 132 (item dutiable indicator code) value.	this attribute allows to report to mailer and/or recipient the dutible status as made by the postal operator.	7.26	event.entity-dutiable-status-change	
mailunit.duty-charging-arrangements	duty and tax payment method applicable to the item, expressed as a UPU codelist 133 (item duty charging arrangements code) value.	this attribute allows to report to mailer and/or recipient the charging arrangements for duties.	7.27	event.customs-payment-arrangements-change	
mailunit.treatment-customs	treatment applied by the Customs to the goods which are subject to customs control, expressed as a coded value.	treatment applied by the Customs to the goods which are subject to customs control, such as returned good or temporary admission.		event.customs-treatment-change	
mailunit.delivery-location-attributes	information describing attributes of the delivery location such as; office/residential, multi-story structure/individual dwelling, etc.	this attribute enables provisions of valuable information to mailers if it is legal to supply such information.		event.delivery-location-attributes	
mailunit.recipient-attributes	information describing attributes of the recipient (e..g person) such as demographic data or preferences concerning receipt of mail items.	this attribute enables provisions of valuable information to mailers if it is legal to supply such information.		event.recipient-attributes	

Table 18 *(continued)*

Mail unit attributes and corresponding events					
Attribute Name	Attribute Definition	Comment	UPU M33	Event name	Comment
mailunit.process-information-third-party-ID	identifier defining the third parties to be notified about the events related to the mail unit.	there are circumstances when a dispute between sender, postal operator and recipient is possible and when provision of information concerning mail unit to a third party (e.g. law enforcement agency) may simplify resolution of the dispute.		event.inform-third-party-ID	
mailunit.post-determined-handling-constraints	constraints not known to the mailer on handling the mail unit imposed by postal processes.	the value of this mail unit attribute is useful when the mail unit is determined to be non machinable by postal operator.		event.entity-machinability-change	
mailunit.image	image of the entire mail item.	this may contain a signature as proof of delivery; may be captured multiple times for various purposes.		event.entity-image-captured	
mailunit.image.identifier	ID used to retrieve/reference the image when the image is stored external to this data structure.	this attribute supports applications using images of mail units.		application dependent	
mailunit.AOI-image	digital image of the area of interest (AOI) of the mail item.	value of this attribute is frequently a portion of the value of the mailunit.image attribute.		event.entity-post-AOI-image-capture	
mailunit.AOI-position	coordinates of the AOI image relative to the agreed upon reference point on the mail unit.			event.entity-post-AOI-image-capture	

Table 18 *(continued)*

Mail unit attributes and corresponding events					
Attribute Name	Attribute Definition	Comment	UPU M33	Event name	Comment
mailunit.AOI-size	length and height of a minimum rectangular area containing AOI image.			event.entity-post-AOI-image-capture	
mailunit.AOI-parsed-elements	values of the fields of information that comprise the AOI.			event.entity-post-AOI-image-capture	
mailunit.DPM-image	image of the digital postal mark area of the mail item.			event.entity-post-DPM-image-capture	
mailunit.DPM-position	coordinates of the DPM image relative to the agreed upon reference point on the mail unit.			event.entity-post-DPM-image-capture	
mailunit.DPM-size	length and height of a minimum rectangular area containing DPM image.			event.entity-post-DPM-image-capture	
mailunit.DPM-parsed-elements	values of the fields of information that comprise the DPM.			event.entity-post-DPM-image-capture	
mailunit.DAB-image	image of the destination address block area of the mail item.			event.entity-post-DAB-image-capture	
mailunit.DAB-position	coordinates of the DAB image relative to the agreed upon reference point on the mail unit.			event.entity-post-DAB-position-capture	

Table 18 *(continued)*

Mail unit attributes and corresponding events					
Attribute Name	Attribute Definition	Comment	UPU M33	Event name	Comment
mailunit.DAB-dimensions	length and height of a minimum rectangular area containing DAB image.			event.entity-post-DAB-size-capture	
mailunit.DAB-parsed-elements	values of the fields of information that comprise the DAB.			event.entity-post-DAB-elements-capture	
mailunit.DAB-skew	the angle of the DAB orientation in reference to the bottom of the envelope.			event.entity-technical defect	
mailunit.DAB-character-size	minimum character size in the printed image.			event.entity-technical defect	
mailunit.DAB-line-spacing	minimum line spacing in the printed image.			event.entity-technical defect	
mailunit.DAB-address-text-corrected	values of the fields of information that comprise the destination address information after it has been validated and corrected.	the value of this attribute is the address information after all postal processing (image capture, OCR, contextual data processing - address database comparison).		event.entity-post-DAB-address-text-corrected	

Table 18 *(concluded)*

Mail unit attributes and corresponding events					
Attribute Name	Attribute Definition	Comment	UPU M33	Event name	Comment
mailunit.destination-address	destination expressed as an address.			event.destination-address-change	
mailunit.destination-address-type	indicator which defines how to interpret the destination address value field.	the value of this attribute is taken from a code list. For example, one code indicates that the address value contains the actual address (street, number, city, etc) and another code indicates that the destination address value contains a pointer to the destination address which was communicated by the customer (sender or recipient) to the postal operator; in this case, the destination address value is known to the postal operator but it is not shown on the mail unit (it may not be known to the sender).		application dependent	

7 Data Constructs: Representation of event information

The data construct described in this clause is designed to form a core part (payload) of a message communicating event information to customers. The data construct makes use of default values for mail unit attributes, observations and expectations thus optimizing transfers of information describing large sets of events.

The data structure has a header section, which identifies the communication and contains information supporting the technical aspects of the information transfer. It does not contain any postal information.

The event default section contains the values of event and mail unit attributes that are used as default values. When large number (batches) of events contain identical mail unit or event attributes only exceptions are individually listed, and the default value is used to store and communicate common attribute values.

The events section contains an itemized list of all events with their ID, dates and attributes, which are different from the default (common) values.

It should be noted that the structure for the default values is very similar to the structure for the itemised events. The difference is that the defaults do not have attributes providing IDs and dates for events, observation and expectations.

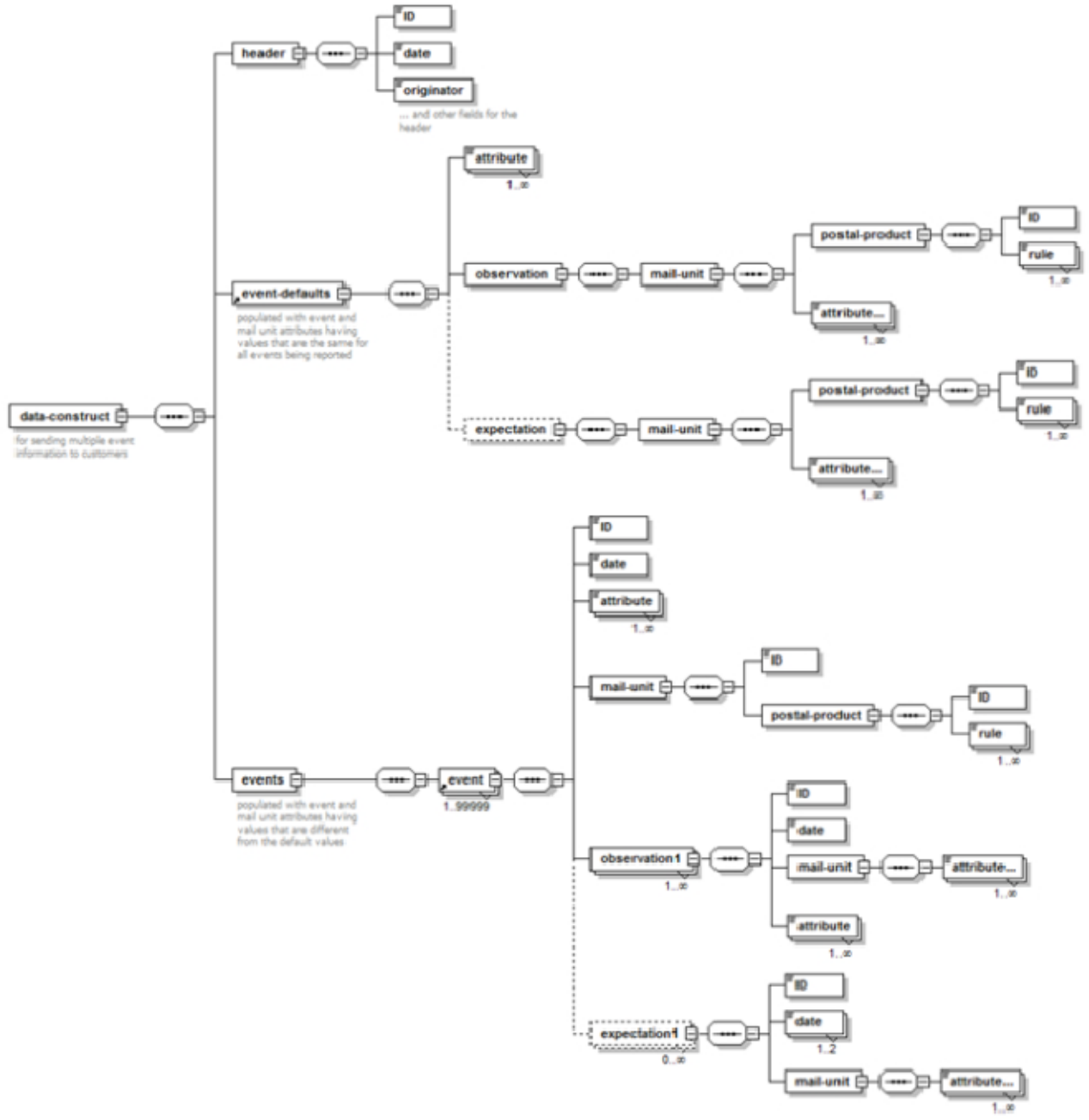

Figure 15 – Data construct for communicating event information

Annex A
(informative)

Example of CDI application

This annex is an example of the application of customer-directed information designed to demonstrate how valuable information can be captured in the postal domain and made available to customers.

As an example, a mailer in Austria wants to send to several of its customers in France mail items containing valuable material (e.g. a memory card or a credit card) on 3 October 2005 from its offices in Vienna. Additional mailer requirements and expectations are:

- All mail items are expected to be delivered on 6 October 2005.
- Mailer used discounted postal rates due to mail items being “postal process friendly” (e.g. items are pre-sorted and barcoded).
- Mailer expects that the integrity of mail items is maintained in a sense that the mail items are delivered intact.
- Mailer would like to observe the whereabouts of mail items up to the delivery point and incorporate tracking information including signature of recipients in its computerised “customer relationship management” application
- Mailer would like to receive information concerning possible defects of mail items that adversely impact their processing and delivery (e.g. cost).

The two postal authorities involved, Austrian Post and La Poste (France), want to deliver service requested by the mailer and be properly paid for the service delivered.

This application is designed around the following mail unit attributes:

- mailunit.customer-applied-ID
- mailunit.originator
- mailunit.originator-electronic-address
- mailunit.original-delivery-address
- mailunit.weight
- mailunit.postage-evidenced
- mailunit.postage-due
- mailunit.expected-delivery-date
- mailunit.size
- mailunit.location
- mailunit.address-block-print-quality-defect-description
- mailunit.replacement-delivery-address

— mailunit.recipient-signature-image

This example describes three observations (see clause 4.4.8) of a given mail unit. The observations selected for this example occur during the following processes:

— Induction (8:00, 3 October 2005) – designated as *Observation 1*

— Outbound Sortation (13:00, 3 October 2005) – designated as *Observation 2*

— Delivery (9:00, 6 October 2005) – designated as *Observation 3*

Observation 1

The attributes of a mail unit and their values for *Observation1* taken at induction at 8:00 on 3 October 2005 are shown in the following table:

Table A.1 – First observation (*Observation 1*)

Attribute Name	***Attribute Value***
mailunit.customer-applied-ID	mailer@mailer.com.345693
mailunit.originator	Mailer ABC, Vienna Austria
mailunit.originator-electronic-address	mailer@mailer.com
mailunit.original-delivery-address	144 Avenue Raspail 94257 Gentilly France
mailunit.weight	25 gr
mailunit.postage-evidenced	0,40 €
mailunit.postage-due	NULL
mailunit.expected-delivery-date	6 October 2005
mailunit.size	20 x 14 cm
mailunit.location	NULL
mailunit.address-block-print-quality-defect-description	NULL
mailunit.replacement-delivery-address	NULL
mailunit.recipient-signature-image	NULL

This observation (Observation 1) reflects the state of the system-wide knowledge of the mail unit under observation. It is assumed that at induction point, all information concerning values of mail unit attributes are known only to the mailer, and those that are not known at all, but expected to become known are marked as NULL.

Observation 2

In this example, the first observation that occurs within the postal domain is the observation taken at the outbound sortation in a mail processing facility where the mail item is being processed. For example, *Observation 2* is taken at 13:00 on 3 October 2005. The values if the attributes after this observation are shown in the following table:

Table A.2 – Second observation (*Observation 2*)

Attribute Name	***Attribute Value***
mailunit.customer-applied-ID	mailer@mailer.com.345693
mailunit.originator	Mailer ABC, Vienna Austria
mailunit.originator-electronic-address	mailer@mailer..com
mailunit.original-delivery-address	144 Avenue Raspail 94257 Gentilly France
mailunit.weight	25 gr
mailunit.postage-evidenced	0,40 €
mailunit.postage-due	0,50 €
mailunit.expected-delivery-date	6 October 2005
mailunit.size	20 x 14 cm
mailunit.location	Postgasse 8, 1010 Wien
mailunit.address-block-print-quality-defect-description	skew, touching lines
mailunit.replacement-delivery-address	NULL
mailunit.recipient-signature-image	NULL

As it can be seen from the table above, the values of several mail unit attributes changed between *Observation 1* and *Observation 2*. These attributes are highlighted in Table A.2. They are:

— amount of postage evidenced is insufficient resulting in postage due of 0.50€ as it was determined by the Austrian Post;

— location of the mail unit changed from NULL to the location of mail unit at the time of the observation (“Postgasse 8, 1010 Wien”);

— technical defects (skew and insufficient line spacing in the address block) were uncovered as a result of mail unit scanning and processing. Accordingly, the value of the print quality attribute has changed from NULL to the description of the specific defect uncovered.

The three changes of the values of the mail unit attributes created an event. This event triggered communication of the observation information to the customer. A suggested data construct for storing event information is given in Clause 5 (XML Schema).

Observation 3

In this example, the third and last observation occurs during delivery process. It is assumed that during this process, a weight measurement, address interpretation and capture of recipient signature take place. In this example, *Observation 3* takes place at 9:00 on 6 October 2005. The values of the attributes after this observation are shown in the following table:

Table A.3 – Third observation (*Observation 3*)

Attribute Name	***Attribute Value***
mailunit.customer-applied-ID	mailer@mailer.com.345693
mailunit.originator	Mailer ABC, Vienna Austria
mailunit.originator-electronic-address	mailer@mailer.com
mailunit.original-delivery-address	144 Avenue Raspail 94257 Gentilly France
mailunit.weight	17 gr
mailunit.postage-evidenced	0,40 €
mailunit.postage-due	0,50 €
mailunit.expected-delivery-date	6 October 2005
mailunit.size	20 x 14 cm
mailunit.location	94257 Gentilly France
mailunit.address-block-print-quality-defect-description	skew, touching lines
mailunit.replacement-delivery-address	14 Avenue Raspail 94257 Gentilly France
mailunit.recipient-signature-image	Tiff Image

As it can be seen from the table, the values of several mail unit attributes changed between *Observation 2* and *Observation 3*. These attributes are highlighted in Table A.3. They are:

— weight of the mail unit has changed from 25 g to 14 g. This indicates possible theft, or some other violation of mail unit integrity;

— location of the mail unit changed from “Postgasse 8, 1010 Wien” to “94257 Gentilly France”. This indicates that the mail item has been observed at the delivery office within proximity of the final destination;

— value of delivery address has been changed reflecting the fact that 144 Avenue Raspail has been incorrect and the post office located the intended recipient destination address located at 14 Avenue Raspail;

— signature image field contains the image of the signature of the intended recipient (addressee).

The four changes of the values of the mail unit attributes created an event. This event triggered communication of the observation information to the customer. A suggested data construct for storing event information is given in Clause 7.

The two changes in the value of mail unit location attribute (from NULL to “Postgasse 8, 1010 Wien”, and from “Postgasse 8, 1010 Wien” to “14 Avenue Raspail 94257 Gentilly”) together with dates when those changes have occurred constitute traditional track and trace information. If changes in the values of other attributes are not important, then the track and trace information is the only information that would be made available to the sender. The track and trace is the minimum information that is generally acknowledged to be valuable to customers.

Annex B
(informative)

Entity relationships diagram

The entity-relationship model is the most widely accepted data model that is used in describing data at a conceptual level [Bibliography]. This annex describes and explains entity-relationship model for a mail communication system and how the basic concepts of mail unit, mail unit attributes, observations, expectations, events and event attributes and their relationships can be used in applications (for example the application commonly referred to as “track and trace”).

In the context of entity-relationship data models the terms “entity” and “object” are frequently used synonymously. However, in order to avoid confusion with the specific term “mail unit” introduced in this standard only the term “object” will be used.

The mail communication system entity-relationship diagram is presented in Figure B.1. It contains seven basic objects and relationships among them. These basic objects are Mail unit, Aggregate, Receptacle, Party, Agent, Postal Product, Observation, Expectation, Event and Statement of Mailing Submission. The last object is somewhat less general than others and included here as an example of a specific concept that is of great importance to large mailers and postal operators. Specific instances of objects are depicted by rectangular shapes inside rectangles representing objects. For example, a letter and a tray containing letters are specific instances of the object “mail unit”. Similarly, mailing submission and induction unit are specific examples of the object “aggregate”. Each of the objects is described by its attributes and the attributes of related objects. For example, the object of “observation” is fully described by its identifier, date, an identifier of the related (or associated) mail unit that it refers to, associated mail unit relevant attributes and its own attributes.

Relationships (or associations) among objects are represented by arrows connecting objects. These arrows describe data constraints known as mapping cardinalities. For example, an event can be computed from one or two observations where one observation is compared with a degenerate or “null” observation, while comparison between two normal observations results in a “normal” event. In a similar way an observation always refers to one mail unit. A party can have multiple agents while an agent is always associated with one party. Mail unit is always associated with (refers to) one postal product.

The entity-relationship diagram brings together important objects, their relationships and data constraints all of which can be productively used in database design.

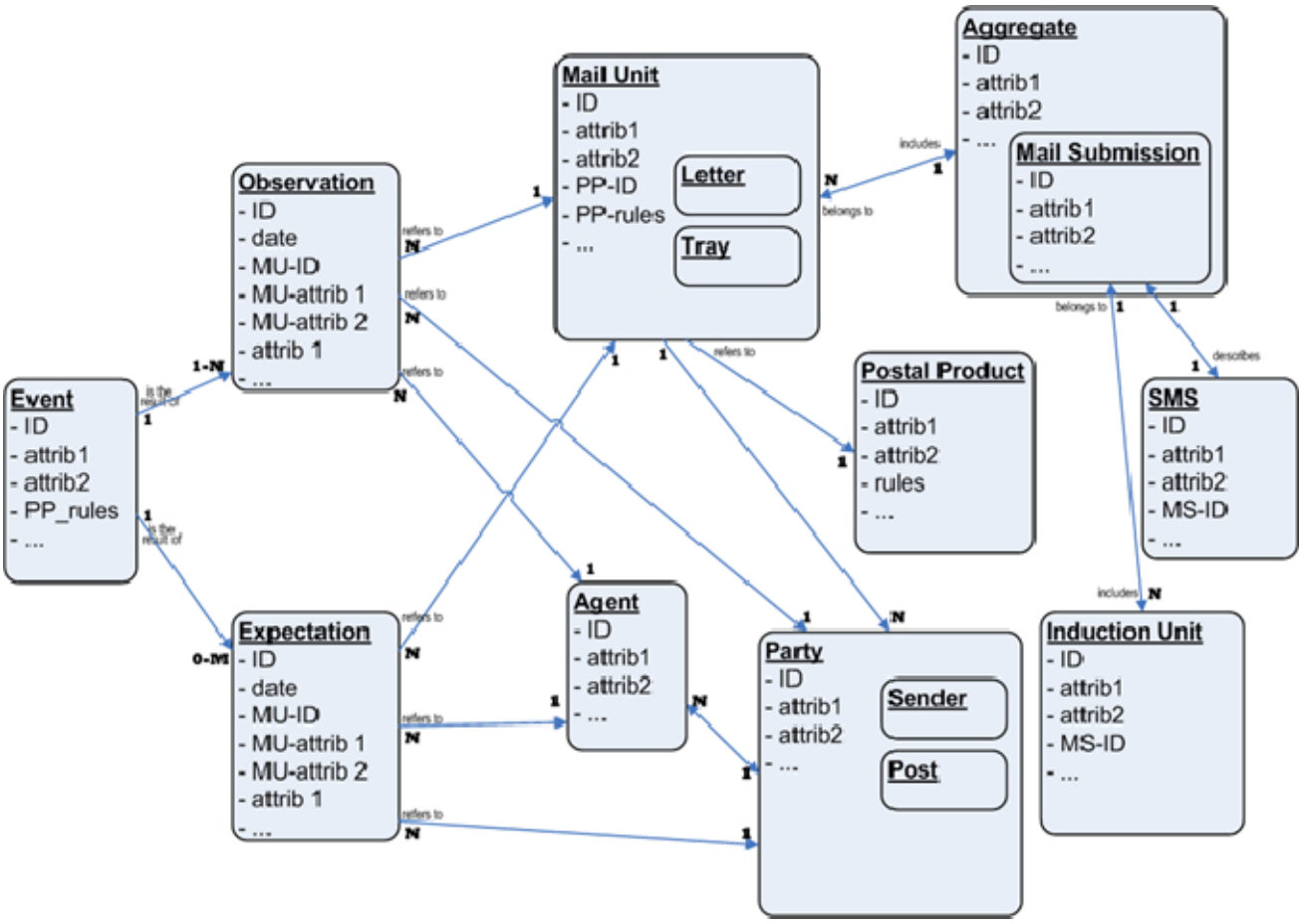

Figure B.1 – Entity relationship diagram

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