# Natural language specification of DOLCE Signature in CLIF

* 1. DOLCE Categories in CLIF (alphabetic order)
     1. AB – Abstract

A member of AB is a member of PT (Particular) that has neither spatial nor temporal qualities and is not a quality itself. Examples: a number, a set, a quality space.

* + 1. ACC – Accomplishment

A member of ACC is a member of EV (Event) which is mereologically non-atomic. Examples: a conference, an ascent, a performance.

* + 1. ACH – Achievement

A member of ACH is a member of EV (Event) which is mereologically atomic. Examples: reaching the summit of K2, a departure, a death.

* + 1. APO – Agentive Physical Object

A member of APO is a member of POB (Physical Object) to which intentions, believes and desires are ascribed. Examples: a human person as opposed to a legal person.

* + 1. AQ – Abstract Quality

A member of AQ is a member of Q (Quality) that directly inheres to a NPED (Non-Physical Endurant). Examples: the value of an asset, the rights of the UN general secretary.

* + 1. AR – Abstract Region

A member of AR is a member of R (Region) which is part of a quality space for abstract qualities. Examples: the conventional value of 1 Euro.

* + 1. AS – Arbitrary Sum

A member of AS is a member of ED (Endurant) which is the mereological sum of two or more endurants (physical or not) but has no unity criterion. Examples: my left foot and my hair, the UN and the Adriatic Sea, the Mount Everest and the void space in my fridge.

* + 1. ASO – Agentive Social Object

A member of ASO is a member of SOB (Social Object) to which intentions, believes and desires are ascribed. Examples: a teacher, a president, a software agent, a nation.

* + 1. ED – Endurant

A member of ED is a member of PT (Particular) which is wholly present, in the sense that all its proper parts are present, at any time that it is present. Examples: a person, a tree, an atom, an idea.

* + 1. EV – Event

A member of EV is a member of PD (Perdurant) which is anti-cumulative, i.e., a perdurant whose sum with another perdurant of the same type, must be a perdurant of a different type. Examples: closing a door, reaching the top of a mountain, breaking a seal.

* + 1. F – Feature

A member of F is a member of PED (Physical Endurant) which has a unity criterion and is existentially dependent on another physical endurant, its host. Examples: a hole, a bump, an object’s boundary, a stain on a t-shirt.

* + 1. M – Amount of Matter

A member of M is a member of PED (Physical Endurant) which has no unity criterion and is mereologically invariant, that is, all its parts are essential parts. Examples: the gold in John’s wedding ring, the sand used to make this glass.

* + 1. MOB – Mental Object

A member of MOB is a member of NPOB (Non-Physical Object) which existentially depends on a member of APO (Agentive Physical Object). Examples: a percept, a sense datum.

* + 1. NAPO – Non-Agentive Physical Object

A member of NAPO is a member of POB (Physical Object) to which intentions, believes and desires are not ascribed. Examples: a pebble, a house, a computer, a human body.

* + 1. NASO – Non-Agentive Social Object

A member of NASO is a member of SOB (Social Object) to which intentions, believes and desires are not ascribed. Examples: a law, an economic system, a currency, an asset.

* + 1. NPED – Non-Physical Endurant

A member of NPED is a member of ED (Endurant) with no direct spatial quality. Examples: democracy, the United Nations, the general secretary of Amnesty International.

* + 1. NPOB – Non-Physical Object

A member of NPOB is a member of NPED (Non-Physical Endurant) which has a unity criterion. Examples: a theory, a topic, a concept.

* + 1. PD – Perdurant

A member of PD is a member of PT (Particular) which happens in time. Examples: a person’s life, a soccer game, the reading of a book, the state of feeling happy. Some perdurants are temporally atomic, for example: the change of a letter’s state due to the breaking of the seal.

* + 1. PED – Physical Endurant

A member of PED is a member of ED (Endurant) which has direct spatial quality. Examples: a person, a tree, an atom, the water in a glass, a hole in a wall, the center of the Earth.

* + 1. POB – Physical Object

A member of POB is a member of PED (Physical Endurant) which has unity criterion. Examples: a person, a human body, a house, a computer.

* + 1. PQ – Physical Quality

A member of PQ is a member of Q (Quality) that directly inheres to a member of PED (Physical Endurant). Examples: the weight of a pen, the color of an apple.

* + 1. PR – Physical Region

A member of PR is a member of R (Region) which is part of a quality space for physical qualities. Examples: the spatial region occupied by Earth, an area in the color quality space, 80Kg.

* + 1. **PRO – Process**

A member of PRO is a member of STV (Stative) such that at some temporal scale it has parts of a different type. Examples: running, writing.

* + 1. PT – Particular

A member of PT is an entity that cannot have instances. The entities which are not particular are usually called universals. Examples: a person, a soccer game, a plan, the color red, a feeling, a fact, a theory, number forty-two.

* + 1. Q – Quality

A member of Q is a member of PT (Particular) that inheres in an endurant or a perdurant, and that can be perceived or measured. Examples: the shape of a book, the color of a car, the size of a t-shirt, the electrical charge of a battery.

* + 1. R – Region

A member of R is a member of AB (Abstract) which is a quality space or part of one. A quality space is a mereological maximal member of R. Examples: the color red is a region in the quality space of color, the red of a rose is a (sub)region of the red region in the quality space of color, the commercial value of 1 Euro is a region in the quality space of commercial values.

* + 1. S – Space Region

A member of S is a member of PR (Physical Region) which is part of the quality space of spatial regions. A member of S can be spatially disconnected. Examples: the region occupied by Earth at this moment, the region where it snowed in the year 1900.

* + 1. SAG – Social Agent

A member of SAG is a member of ASO (Agentive Social Object) which is an individual. Examples: a teacher, a president, a software agent.

* + 1. SC – Society

A member of SC is a member of ASO (Agentive Social Object) which is a collective. Examples: a nation, the FCA Group, Apple, the European Central Bank.

* + 1. SL – Spatial Location

A member of SL is a member of PQ (Physical Quality) and is the individual spatial quality of a PED (Physical Endurant). Examples: the spatial quality of the Earth, the spatial quality of a hole, the spatial quality of Adolf Anderssen.

* + 1. SOB – Social Object

A member of SOB is a member of NPOB (Non-Physical Object) which is generically dependent on a community of agents. Examples: a person in the legal sense, a client, a law, an economic system.

* + 1. ST – State

A member of ST is a member of STV (Stative) such that all its parts are of the same type. Examples: being sitting, being open, being happy, being red.

* + 1. STV – Stative

A member of STV is a member of PD (Perdurant) which, when summed to another perdurant of the same type, gives a perdurant of the same type. Examples: sitting, walking, waiting.

* + 1. T – Time

A member of T is a member of TR (Temporal Region) which is an interval or a sum of intervals. Examples: the first second of your life, the Cretaceous time period, the time interval of all winters of the third millennium.

* + 1. TL – Temporal Location

A member of TL is a member of TQ (Temporal Quality) which is the temporal quality of a perdurant, i.e., the time spanned by that specific perdurant: two concurrent perdurants have distinct temporal locations even though they span the same temporal interval. Examples: the temporal quality of World War I, the temporal quality of the Anderssen-Kieseritzky chess play in 1851, the summers of the 20th century.

* + 1. TQ – Temporal Quality

A member of TQ is a member of Q (Quality) that directly inheres to a perdurant. Examples: the duration of World War I, the starting time of the 2000 Olympics.

* + 1. TR – Temporal Region

A member of TR is a member of R (Region) which is part of the quality space of temporal regions. Examples: the time interval of World War I, the time interval of this year, the time interval at which the first step on the Moon took place.

* 1. DOLCE Predicates in CLIF (alphabetic order)
     1. at – Atom (unary)

(at x) stands for “x is an atom”. An entity is an atom when it an abstract or a perdurant and does not have proper parts: at holds on an abstract or perdurant x whenever there exists no y which is a proper part of x. Example of use: the change of citizenship is an atomic perdurant.

* + 1. atP – Atomic Part (binary)

(atp x y) stands for “x is an atomic part of y”. An entity is an atomic part of another when the first is an atom and part of the second: atp holds on pair x, y whenever x is an atom and x is part of y. Example of use: The end of the first half of the game is an atomic part of the game.

* + 1. diff – Difference (ternary)

(diff z x y) stands for “z is the difference of x and y”. diff applies to pairs of abstracts and to pairs of perdurants. An abstract entity is the difference of two abstract entities x and y when everything that is part of the difference is part of x and does not overlap y, and vice versa. Analogously, a perdurant is the difference of two perdurants x and y when everything that is part of the difference is part of x and does not overlap y, and vice versa. Example of use: The core of John’s lecture is the lecture that he gave without the introduction to the topic (more formally, the core of John’s lecture is John’s lecture minus the part in which he introduced the topic).

* + 1. dQt – Direct quality (binary)

(dQt x y) stands for “x is a direct quality of y”. dQt applies to pairs where the first argument is a quality and the second an endurant or a perdurant: dQt holds on pair x, y when x is an individual quality of y. Example of use: John’s age (more formally, John has his own age quality).

* + 1. k – Constitution (ternary)

(k x y t) stands for “x constitutes y at time t”. k is a ternary relation between two endurants and time interval or between two perdurants and a time interval: k holds on pair x, y at t when x is the substratum of y during the whole time interval t. Example of use: this wood constitutes this table (until some component is substituted).

* + 1. ov – Overlap (binary)

(ov x y) stands for “x overlaps y”. Two abstracts or two perdurants overlap when they have some part in common: ov holds on a pair x, y whenever there exists an entity z which is part of both x and y. Example of use: yesterday John worked while eating (more formally, John’s eating and John’s working overlapped yesterday).

* + 1. p – Parthood (binary)

(p x y) stands for “x is part of y”. p is a reflexive, antisymmetric and transitive relation that applies to pairs of abstracts, and to pairs of perdurants. It gives a partial order on each of these two categories. It is logically synonymous with a complete extensional mereology on these categories. Example of use: The introduction of the topic is part of the lecture.

* + 1. pc – Participation (ternary)

(pc x y t) stands for “endurant x participates in perdurant y at time t”. pc is a ternary relation between an endurant, a perdurant, and a time interval t. pc holds on a pair x, y when the endurant x takes part of the perdurant y. Example of use: John was one of the players in yesterday’s soccer game.

* + 1. pp – Proper Parthood (binary)

(pp x y) stands for “x is proper part of y”. An entity is proper part of another when the first is part of the second but the second is not part of the first: pp holds on a pair x, y when x is part of y and y is not part of x. Example of use: The introduction of the topic is only a part of the lecture.

* + 1. pre – Presence (binary)

(pre x t) stands for “x is present at time t”. An entity is present at the time in which its temporal quality has a temporal location: pre holds on a pair x, t when the temporal location associated with x includes t. pre applies to endurants, perdurants and qualities. Example of use: John’s birthday party was yesterday (more formally, John’s birthday party was present yesterday).

* + 1. ql – Quale (binary)

(ql x y) stands for “x is the quale (value) of quality y”. ql holds between a region of a quality space and a quality of a perdurant, it states the location or value of that quality. Example of use: The value of John’s age is 32 years.

* + 1. sum – Sum (ternary)

(sum z x y) stands for “z is the sum of x and y”. sum applies to pairs of abstracts and to pairs of perdurants. An abstract entity is the sum of two abstract entities when everything that overlaps the first overlaps at least one of the others, and vice versa. Analogously, a perdurant is the sum of two perdurants when everything that overlaps the first overlaps at least one of the others, and vice versa. Example of use: John’s reply to your question is the sum of John’s thinking what to answer and John’s saying it.

* + 1. sd – Specific Constant Dependence (binary)

(sd x y) stands for “x is specifically constant dependent on y”. sd holds between two entities x, y when x cannot exist at a time t unless y exists at the same time t. Example of use: John’s height is specifically constant dependent on John’s body.

* + 1. tAt – Temporary Atom (binary)

(tAt x t) stands for “x is atomic at time t”. An entity is a temporary atom at t when it is an endurant that does not have proper parts during t: tAt holds on an endurant x at a time t provided x is an atom during the whole time interval t. Examples: an amount of matter when it reduces to a quantum, the barycenter of a device.

* + 1. tAtP – Atomic Part (ternary)

(tAtP x y t) stands for “x is an atomic part of y at time t”. An entity is an atomic part of another when the entities are endurants, the first is an atom and it is part of the second: tAtP holds on a pair of endurants x, y whenever x is an atom and x is part of y during the whole time interval t. Examples: a quantum which is part of a device during the time interval.

* + 1. temporalPart – Temporal Part (binary)

(temporalPart x y) stands for “x is a temporal part of y”. temporalPart applies to pairs of perdurants. temporalPart holds on a pair perdurants x, y when x is the maximal part of y relatively to the whole time spanned by x. Example of use: The first half of the soccer game is a temporal part of the game.

* + 1. tOv – Temporary Overlap (ternary)

(tOv x y t) stands for “x overlaps y at time t”. tOv applies to pairs of endurants and a time interval. tOv holds on a pair of endurants x, y if x overlaps y during the whole time interval t. Example of use: John’s radio and TV systems now overlap, recently he attached them to the same speakers.

* + 1. tP – Temporary Parthood (ternary)

(tP x y t) stands for “x is part of y at time t”. tP applies to pairs of endurants and a time interval. tP holds on a pair of endurants x, y if x is a part of y during the whole time interval t. Example of use: The water that John drinks is (part of) the water I put in the fridge earlier.

* + 1. tPp – Temporary Proper Part (ternary)

(tPp x y t) stands for “x is proper part of y at time t”. tPp applies to pairs of endurants and a time interval. tPp holds on a pair of endurants x, y if x is a proper part of y during the whole time interval t. Example of use: John’s car has a new engine, he changed it yesterday.

* + 1. tql – Temporary Quale (ternary)

(tql x y t) stands for “x is the quale (value) of quality y at time t”. tql holds between a region of a quality space, a quality of an endurant or of an abstract, and a time interval. tql states the location or value of that quality during the whole time interval t. Example of use: John’s height is 182 cm this year (more formally, the quale/value of John’s height quality is 182 cm).

* + 1. tsum – Temporary Sum (4-ary)

(tsum z x y t) stands for “z is the sum of x and y at time t”. tsum applies to a triplet of endurants and a time interval. tum holds on a triplet z, x, y at time t if z is the sum of x and y during the whole time interval t. Example of use: the hammer is the handle plus the head.