

Time Links

Adapted from the “TimeML Annotation Guidelines version 1.2.1” by Roser Saurí et al., 2006.

What is a Time Link?

A time link is a relationship between two times, two events, or an event and a time. It indicates that a particular relationship in time holds between the two, that, for example, they happen at the same time (1) or one happens for the duration of the other (2). Other less intuitive examples of time links between two events include if one event is temporally related to a specific subpart of another event (3), or imposes a truth-condition on another event (4).

- (1) The train [arrived] at (8:10 p.m).
- (2) He [was stuck] on that island for (almost a year).
- (3) John [started] (to read).
- (4) John [forgot] (to buy) some wine.

Here, as in all examples in this guide, the word that signals the time link (if any) is underlined, and the events or times that participate in the relationship are surrounded by brackets or parentheses.

You will annotate the following items for every time link:

- Link Type – the type of link, either Temporal, Aspectual, or Subordinating
- Relation Type – The specific relation type, which depends on the link type
- Subject – the time or event in the “subject” position of the relationship
- Object – the time or event in the “object” position of the relationship

In addition, some temporal expressions may require additional information

- Signal – is there a word or set of words that specifically signals the relationship?

Link and Relation Type

Each time link needs to be assigned a link type and a relation type. Valid link types are Temporal, Aspectual, and Subordinating. The link type determines the relation type that may be assigned to the link.

Temporal

A temporal time link may hold between two events, two times, or an event and a time. This is the only link type that may hold between a time expression and something else. It indicates a concrete temporal relationship between two events. Valid relationship types for a temporal link include

Before (5), After, Immediately Before, Immediately After (6), Includes (7), Included By, During (8), Subsumes, Beginning, Begun By (9), Ending, Ended By (10), and Identity (11). These

- (5) The police have investigated [the slayings], and suspects already (have been arrested).
- (6) They [died] when the plane (crashed) into the mountain.
- (7) John [arrived] in Boston (last Thursday).
- (8) John [was CTO] for (two years).
- (9) John was [in the gym] starting at (6:00pm).
- (10) John was [in the gym] until (7:00pm).
- (11) John [drove] to Boston. During his (drive) he ate a donut.

Of the 13 temporal relationships, 6 are inverses of another 6, as shown in the left two columns of Table 1.

Aspectual

An aspectual link holds only between two events. Valid relation types are Initiates, Culminates, Terminates, Continues, and Reinitiates. If you are familiar with the Event annotation guidelines, then the subject event (the event that occurs in the “subject” position of the relationship), should be of the Aspectual event class.

- (12) John [started] (to read).
- (13) John [finished] (reading).

Subordinating

A subordinating link holds only between two events. Valid relation types are Modal (14), Factive (15), Counter-Factive (16), Evidential (17), Negative Evidential (18), and Conditional (19). If you are familiar with the Event annotation guidelines, then the subject event should be of the Perception, Intensional Action, Intensional State, or Reporting event class.

- (14) Mary [wanted] John (to buy) some wine.
- (15) John [managed] (to buy) some wine.
- (16) John [forgot] (to buy) some wine.
- (17) John [said] he (bought) some wine.
- (18) John [denied] he (bought) some wine.
- (19) If John [buys] the wine, Mary (will thank) him.

Temporal		Aspectual	Subordinating
After	Before	Initiates	Modal
Immediately After	Immediately Before	Culminates	Factive
Includes	Included by	Terminates	Counter-Factive
During	Inverse During	Continues	Evidential
Begins	Begun By	Reinitiates	Negative Evidential
Ends	Ended By		Conditional
Simultaneous			
Identity			

Table 1: Temporal Link relation types

Temporal Link Relation Types

As noted above, the temporal link type can hold between two events, two times, or an event and a time. The relations are described below, and illustrated graphically in Figure 1.

Simultaneous

Two event instances are judged simultaneous if they happen at the same time, or are temporally indistinguishable in context, i.e., occur close enough to the same time that further distinguishing their times makes no difference to the temporal interpretation of the text.

Identity

Event identity indicates that two event mentions refer to the same event. It is a co-referential relationship, as in (20).

(20) John [drove] to Boston. During his [drive] he ate a donut.

After & Before

One event B is After another event A if A precedes B in time, as in (21). Before is the direct inverse of After, except with the subject and object reversed. These two relationships merely indicate an order, and do not imply immediacy to the relationship, as in Immediately After and Immediately Before. In the case of (21), we have Before(slayings, arrested).

(21) The police looked into the [slayings] of 14 women. In six of the cases suspects have already been (arrested).

Immediately After & Immediately Before

These two relationships are like After and Before, but they imply an immediacy to the relationship. In cases where the subsequent event could not possibly be separated from the preceding event by any amount of time, choose this relationship over the plain After or Before. The difference between these two sets of relationships is analogous to the difference between “less than” and “less than or equals”. In the case of (22), we have ImmediatelyAfter(died, crashed)

(22) All passengers [died] when the plane (crashed) into the mountain.

Includes & Included by

These relationships indicate a subset relationship, that (in the case of Includes) an event or time A starts after another event or time B, and A also ends before B. In the case of (23), we have IncludedBy(arrived, last Thursday). A preposition that suggests this relationship is “on” – if you can insert “on” between the two related events or times and the semantics are unchanged, then it is probably an Includes relationship.

(23) John [arrived] in Boston (last Thursday).

During & Inverse During

These two relationships are specifically applicable to states or events that persist throughout a duration, as in (24) and (25). Use During and Inverse During only to link an event and a time, and

only when the time specifically indicates a duration. Triggering words here, in contrast to Includes and its inverse, are “for” and “during”. **So is DURING like SIMULTANEOUS?**

- (24) James [was CTO] for (two years).
 (25) John [taught] for (20 minutes) on Monday.

Begins & Begun by

These two relationships indicate that the two related events or times start simultaneously, but that one of the events or times ends before the other, as in (26). Thus these are more specialized relationships than Includes or Included by. In (26), we have BegunBy(at the gym, 6:00pm).

- (26) John was [at the gym] between (6:00 pm) and 7:00 pm.

Ends & Ended by

These relationships are the same as the previous set, but the restriction is at the end of the relevant time periods. In (26), we have EndedBy(at the gym, 7:00pm).

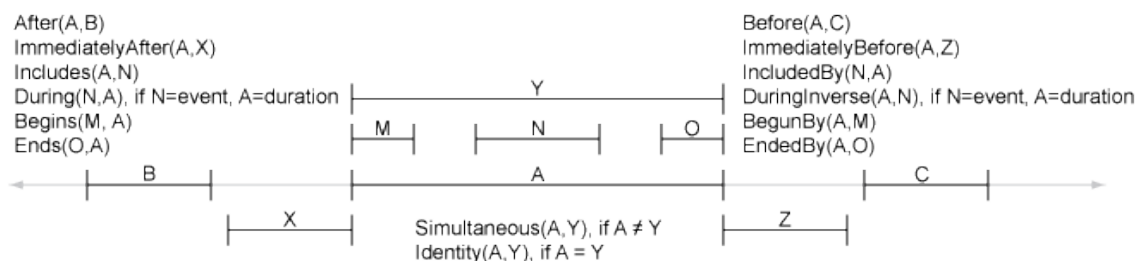


Figure 1: Illustration of temporal relationships between events or times located on a timeline, relative to an event or time A.

Subordinating Link Relation Types

As noted above, the subordinating link type is used for relationships between two events.

Factive

Certain verbs introduce an entailment (or presupposition) of their argument's veracity. They include *forget* (with a tensed complement), *regret* or *manage*, as in (15). **MORE EXPLANATION. MAKE THIS OUR DEFAULT SUBORD. LINK**

Counter-Factive

Contrary to the Factive relation, the Counter-Factive marks the case where an event introduces a presupposition about the non-veracity of its argument, such as *forget (to)*, *unable (to)*, *prevent*, *cancel*, *avoid decline*, etc, as in (16).

Evidential

Evidential relationships are typically introduced by Reporting or Perception events, as in (17).

Negative-Evidential

As for Evidential, Negative-Evidential is usually introduced by Reporting or Perception events, and conveys a negative polarity, as in (18).

Conditional

A condition relationship can occur between any two event instances and is generally accompanied by a signal such as *if*. The antecedent of the conditional takes the place of the introducing event instance

Modal

A modal relation is brought up by events introducing a reference to a possible world – mainly Intensional Actions and Intensional States, as in (14).

When to Annotate Temporal & Aspectual Links

Every event and time should be linked by either a temporal or aspectual time link to another event or time. This allows us to determine, in the narrative world, the proper order of events.

Rule NN: Every event and time should participate in a temporal or aspectual link.

In particular, every non-Aspectual event and every time expression should be involved in a Temporal Time Link to another event or time expression. On the other hand, Aspectual events should participate in an Aspectual time link to another event to which it is aspectually related.

Rule NN: Every non-Aspectual event and every time expression should participate in a temporal link.

Rule NN: Every Aspectual event should participate in an aspectual link.

When to Annotate a Subordinating Link

Every Intensional Action, Intensional State, Perception, and Reporting event should be involved in a Subordinating time link. These events generally take a clausal complement (such as a purpose clause or conditional) or a noun phrase headed by an event-denoting nominal. The Subordinating time link is between those events and the one denoted by the complement.

Rule NN: Perception events always introduce subordinating links of type evidential or negative evidential.

Rule NN: Intensional Action or Intensional States may introduce subordinating links of type modal, factive, or counter factive.

Rule NN: Reporting events can introduce subordinating links of any type.

Notes

- First convention: Maintain links going forward whenever possible. If you have a choice between After and Before, choose the one where the subject occurs before the object in text order.
- Does “not” on an event change factive relationship?
- John did not forget that he bought the wine. → Factive relationship
- John forgot that he bought the wine. → also Factive relationship
- Problematic example
- He seized her and dragged her to his lair, but did not devour her.
- Before(seized, dragged) → not problematic, but what about Before(seized, did not devour) or Before(dragged, did not devour) ? First might be because he could have devoured her right after seizing her, but did not. Second because the text is making sure to point out that she was not devoured at the time when the author expects the reader to expect it. Jared’s point is good that “he did not devour her” at all points in the story, so this makes us prefer the second. The question is what is the “policy of the dragon” – does he usually seize, take, then devour (take-out) or seize then devour (dine-in)? Or perhaps the seizing begins the “not devouring” which is then ended much later?
- Is a question identical to its answer? E.g., “What are you doing?” he asked. “I am weaving a tackle” he said., do we have Identity(doen, weaving)

Summary of Rules

Temporal Expressions

#	Rule
1	One possibility for a rule is to set one column of the temporal links as “default”, and always choose that one as long as the inverse is not explicitly signaled. Or, we could say the link type which preserves $X R Y$, with X is before Y in the text. Advantage here is that when you annotate a relation, the related event is already highlighted, so you can just move directly to the next relation, saving keystrokes

Glossary

word a definition for lay people

Notes

- #2, line 20, "She became absorbed in games" -> is "absorbed" a verb or an adjective?
- Question: If "she said "x, y, z", then do we do Sub(said, x) & Sub(said, y) & Sub(said, z) or do we do Sub(said,x) & Before(x, y) & Before(y,z)?
- What about commands? #2, line 31, "She saw a stove; Tell me, stove, where have they gone?"
- Should we introduce an Identity relationship between the two hides? "Please hide me!", and the river hid her."
- If the "saying" event is implicit, and not marked, should we introduce an Evidential link between the last saying event for that character and the said thing? E.g., He said: "Have you measured all his money, little fox?" The fox answered: "All of it. Now, tsar, I have come for a good purpose: give your daughter in marriage to Bukhtan Bukhtanovich." "Very well; show me the suitor."
- What about questions to the listener, should these be marked as events, and if so, how do the connect via links? How about Before(vanished, was), Before(was, dare), Modal(dare, appear) "The prince chased it; he galloped and galloped, but could not catch the goat, and when he returned the princess had vanished. What was he to do? How could he dare to appear before the king?"
- What about "When X, do Y", should this be Conditional? As in following example: Before(be, comes), Conditional(comes, give), etc. "Very well," said the king, "be my herdsman. When the three-headed dragon comes to your herd, give him three cows; when the six-headed dragon comes, give him six cows; and when the twelve-headed dragon comes, count off twelve cows."
- "The next day she gave Princess Maria the same crust, and sent her elder daughter with her, saying: "Give an eye to what Princess Maria feeds herself with." Question: what is the relationship between Give and Feeds? Factive? Evidential? Possibly include this as a problematic sentence