

# Annotating Events in English

## TimeML Annotation Guidelines

Version TempEval-2010

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## 1 Introduction

This document describes the annotation guidelines employed for annotating event instances in the English dataset of the TempEval 2010 evaluation, one of the tasks in the SemEval International Workshop on Semantic Evaluations.<sup>1</sup>

The annotation will be according to the TimeML language (Pustejovsky et al., 2005), a specification language for events and temporal expressions. TimeML was first developed in 2002 in an extended workshop called TERQAS (Time and Event Recognition for Question Answering Systems),<sup>2</sup> which focussed on the issue of answering temporally based questions regarding events and entities in news articles. In 2003, TimeML was further developed in the context of the TANGO workshop (TimeML Annotation Graphical Organizer).<sup>3</sup> In addition, TimeML has been consolidated as an international cross-language ISO standard (ISO WD 24617-1:2007), and was approved as the annotation language for TempEval (Verhagen et al., 2007, 2009).

The annotation process will be split into two sequential subtasks. First, identifying what are the events in text, and then characterizing them with their appropriate attributes (e.g., tense, aspect, or polarity). The structure of the present document reflects this division. Section 2 gives an overview of the notion of event as understood in TimeML. Then, section

<sup>1</sup><http://nlp.cs.swarthmore.edu/semeval/tasks/index.php>

<sup>2</sup><http://www.timeml.org/site/terqas/index.html>

<sup>3</sup><http://www.timeml.org/site/tango/index.html>

3 and 4 address the issue of **event identification**, laying out first what to annotate as events and then describing how much text to mark up as such –i.e., its extent. Finally, section 5 focuses on the task of **attribute annotation**.

## 2 Events in TimeML

We use *event* as a cover term for situations that *happen, occur, hold, or take place*. Events can be punctual (1-2) or last for a period of time (3-4). We also consider as events those predicates describing *states* or *circumstances* in which something obtains or holds true (5).

- (1) Ferdinand Magellan, a Portuguese explorer, first **reached** the islands in search of spices.
- (2) A fresh flow of lava, gas and debris **erupted** there Saturday.
- (3) 11,024 people, including local Aeta aborigines, **were evacuated** to 18 disaster relief centers.
- (4) “We’re **expecting** a major eruption,” he said in a telephone interview early today.
- (5) Israel has been scrambling to buy more masks abroad, after a **shortage** of several hundred thousand gas masks.

Events may be expressed by means of tensed or untensed verbs (6-7), nominalizations (8), adjectives (9), predicative clauses (10), or prepositional phrases (11):

- (6) A fresh flow of lava, gas and debris **erupted** there Saturday.
- (7) Prime Minister Benjamin Netanyahu called the prime minister of the Netherlands **to thank** him for thousands of gas masks his country has already contributed.
- (8) Israel will ask the United States to delay a military **strike** against Iraq until the Jewish state is fully prepared for a possible Iraqi **attack**.
- (9) A Philippine volcano, **dormant** for six centuries, began exploding with searing gases, thick ash and deadly debris.
- (10) “There is no reason why we would not **be prepared**,” Mordechai told the Yediot Ahronot daily.
- (11) All 75 people **on board** the Aeroflot Airbus died.

In the interest of highlighting the point being made, in the sentences above there are “markables” (i.e. elements to be marked up in actual annotation) which here are not shown as tagged. In (7), for instance, neither *called* nor *contributed* are annotated. In practice, however, the annotator will mark up **all** markables during actual annotation. This will be true of many additional examples given as this document proceeds.

### 3 What to annotate as events

The current section details what expressions will be considered as denoting events. Each subsection focuses on a different part of speech: verbs, nouns, adjectives, prepositional phrases, and other constructions. For your convenience, these guidelines are summarized in Tables 1 and 2 (in the appendices).

#### 3.1 Events denoted by VERBS

We consider that all verbal predicates express an event and hence will be marked up as such, including those which denote states. In the sentences below, the verbal event expressions are indicated in bold face and between square brackets.

- (12) a. The citizens of Loudon county [**embrace**] religious and human freedom.  
b. Amir, 27, [**is serving**] a life sentence for the November 1995 assassination of Rabin at a Tel Aviv peace rally.  
c. President Clinton [**says**] he and Blair [**will stand**] together not just on Iraq but also on **arresting** the terrorists.  
d. We [**are going**] [**to maintain**] our forces in the region for the foreseeable future.  
e. “Some of these bands of kidnappers [**are made up**] of foreigners,” Toledo [**said**].  
f. Only Saudi Arabia [**has**] more oil reserves.  
g. With Kuwait now [**annexed**], Iraq [**has control**] of 20 percent of the world’s oil reserves.  
h. Israel [**has been scrambling**] [**to buy**] more masks abroad, after a shortage of several hundred thousand gas masks.

#### 3.2 Events denoted by NOUNS

Nouns which express an event accept to appear in at least two of the following contexts:

- NOUN *lasted for several seconds/minutes/days/years/...*
- NOUN *was very fast/immediate/...*
- NOUN *took/takes/will take place in* TEMPORAL EXPRESSION
- NOUN *began/continued/ended in* TEMPORAL EXPRESSION

Event-denoting nouns will be marked up according to the following guidelines:

1. **Prenominal modifiers.** Event-denoting nouns acting as prenominal modifiers, like those in bold face below, will NEVER be annotated as events.

- (13) a. Many of the same reactions occur in a [**panic** attack].  
b. The likely shape of the [**leadership** contest] emerged yesterday as Labour began an inquest on its [**election** defeat].

Other common cases involve the use of present participle forms. They will have the same policy applied.

- (14) a. the **waiting** room  
b. **knitting** needle  
c. **shooting** match  
d. **drinking** problem

2. *Sortal states*. Sortal states are generally expressed by:

- Agentive nominals; that is, nouns referring to the agents of certain activities or actions. In most cases they correspond to deverbal nouns (e.g., *employer*, *winner*, *customer*), but not always (e.g., *passenger*, *pedestrian*).
- Nouns denoting professions, roles, or positions (e.g., *doctor*, *plumber*, *CTO*, *scholar*).
- Rigid designators; that is, terms referring to the same entity in all possible worlds; e.g., *the 3rd president of America*.

These elements will be annotated as events ONLY when functioning as the head of a *predicative complement*. A predicative complement expresses a predication and is the complement of a verb belonging to one of the classes listed below, among others. In the examples that follow, the predicative complement is in square brackets and the sortal state in bold face.

- Copulative predicates (e.g., *to be*, *seem*, etc.) –underlined below.  
(15) Currently she is [**President** of the Macedonian Teachers Association in Victoria. ]
- Inchoative predicates (e.g., *become*). They express the coming to existence of a situation.  
(16) In 1821 Simón Bolívar became [the first **president** of the Republic of Bolivia].
- Aspectual predicates (e.g., *begin*, *continue*, *end*, *finish*, etc.).  
(17) He continued as [**director** of research at the Bell Telephone. Laboratories established in 1925].
- Change of state predicates, that is, any predicate expressing the coming to be or ending of the position expressed by the sortal state, such as *retire*, *appoint*, *elect*, *resign*, etc.  
(18) In 1998 she retired as [a **professor** emeritus of mathematics].
- Predicates of evaluation and description (e.g., *consider*, *describe*, *depict*, *evaluate*, etc.).  
(19) Daimler is considered [the first **inventor** to have invented a practical internal-combustion engine].

3. *All other event-denoting nouns* will be marked up as events ALWAYS. For example:

- (20) a. An **embargo** on Iraq could plunge the U.S. into a **depression** and the rest of the world into an economic **crisis**.  
b. The economic **chokehold** appears to be working.  
c. Through the Pope, Cuba can begin a more productive **relationship** with the world.  
d. The men explained that that was an **attack** by masked individuals.  
e. Here again, it was the democratic government that quickly became a **threat** to the United States.  
f. Moscow depicted the **situation** as a **conflict** between “the forces of democracy and progress against those of reaction”.

We strongly recommend annotators to use table 1 and 2 (in the appendices) for a general overview of these conditions during the annotation process.

### 3.3 Events denoted by ADJECTIVES

Adjectives generally express a property or attribute of an entity, and as such, they denote an event of a stative nature. Adjectives can appear in attributive or predicative position. *Attributive adjectives* function as premodifiers of the noun:

- (21) a. **furious** reaction  
b. **unbearable** pain  
c. **fair** trial  
d. **beautiful** garden

On the other hand, *predicative adjectives* act as the predicative complement of a verb belonging to one of the types listed below, among others. In the examples, the main verb is underlined and the predicative adjective is in bold face.

- Copulative predicates (e.g., *be*, *seem*, etc.).

(22) The students seemed **exhausted** after three weeks of classes.

- Inchoative predicates (e.g., *become*, *turn into*). They express the coming to existence of a situation.

(23) The Chinese dissident said he left China because his life became **unbearable** there.

- Aspectual predicates (e.g., *begin*, *continue*, *finish*, *terminate*, etc.).

(24) Families kept **hopeful** and many did see the return of their loved ones.

- Causative predicates (e.g., *cause*, *make*, etc.).

(25) Dan Hollander, skater and entertainer, really made the audience **happy**.

- Change of state predicates in general.
- Predicates of perception (e.g., *look*, *hear*, etc.).

(26) Ellen DeGeneres and Portia de Rossi looked **ecstatic** as they married in an intimate ceremony on Saturday.

- Predicates of evaluation and description (e.g., *consider*, *describe*, *present*, etc.).

(27) He is often characterized as **eccentric**.

When annotating adjectives, the following guidelines apply:

1. **Attributive adjectives.** NO adjective in attributive position will be marked up as event.
2. **Predicative adjectives.** We will only annotate as events those predicative adjectives that express a non-persistent property of the entity denoted by the noun.

There are indeed many properties of entities that can be considered as non-persistent. People, for instance, can change their nationality and cars can be painted into a color different than their original one. According to these considerations, the adjectives *Senegalese* in (28), and *red* in (29) should be marked up as events.

(28) Most of the people aboard were **Senegalese**, including many schoolchildren.

(29) The defendant's car was **red**.

However, we will ONLY annotate those adjectives satisfying at least one of the following conditions:

- a. The property they denote is clearly fluid, non-persistent, such as *red* in (30) but not in (31).

(30) Nyck's face turned **red** with shame and anger.

(31) The defendant's car was **red**.
- b. The property is presented as temporally bound to a particular point or period of time.

(32) France was **under-developed** in the eighteenth century, and Germany at the beginning of the nineteenth.
- c. The property is presented as the opinion, knowledge, or belief of somebody, or as a matter under discussion; e.g., *Senegalese* in (33) but not in (34).

(33) The government claims that some abductees are themselves **Senegalese**.

(34) Most of the people aboard were **Senegalese**, including many schoolchildren.

Some cases may be hard to evaluate. As a general rule, **in case of doubt do NOT annotate** the adjective.

We recommend annotators to use tables 1 and 2 (in the appendices) for a general overview of the guidelines for adjectives during the annotation process.

### 3.4 Events denoted by PPs

PPs denoting events will be annotated **ONLY** when functioning as predicative complements. This involves PPs that are complement of verbs belonging to the types listed below, among others.

- Copulative predicates (e.g., *be*, *seem*, etc.).

(35) No woman has been **in charge** of a mission until now.

- Inchoative predicates (e.g., *become*). They express the coming to existence of a situation.

(36) As a boy, he was an excellent horseman and also became **on good terms** with a tribe of Sioux Indians .

- Aspectual predicates (e.g., *begin*, *continue*, *finish*, *end*, etc.).

(37) The US economic and political embargo has kept Cuba **in a box**.

- Causative predicates (e.g., *cause*, *force*, *put*).

(38) She says this puts the very existence of women **at the hands of their husbands**.

- Etc.

### 3.5 Events denoted by OTHER ELEMENTS

Events can also be referred to by other elements, most typically locative adverbs such as *here* and *there* (39). They will be marked up only when functioning as a predicative complement.

(39) a. We're **there** to stay for a fairly lengthy period.

b. We are **here** because what happens on this island will also have an impact on the United States.

## 4 Event extents

This section addresses what to mark as the span, or extent, of the event tag.

### 4.1 Events expressed by SENTENCES, CLAUSES, OR VPs

The general rule for events expressed by sentences (40a), clauses (40b), or VPs (40c) is *to annotate only the verbal head of the construction*. In the examples below, the event construction is delimited by square brackets, whereas the extent to mark up is indicated in bold face. Note that the examples may present other event expressions, but this section focuses just on those verbal events delimited by the brackets.

- (40) a. [He **sold** the property to five buyers].  
b. Bush held out the prospect of more aid to Jordan [if it **cooperates** with the trade embargo].  
c. And Wong Kwan will be lucky [to **break** even].

There is a number of verbal constructions expressing events. In some of them, the general rule above applies straightforwardly, others need additional guidance. They are covered in what follows.

**Simple VPs.** The event tag covers the verbal head, as stipulated by the general rule.

- (41) a. A fresh flow of lava, gas and debris **erupted** there Saturday.  
b. Bush held out the prospect of more aid to Jordan if it **cooperates** with the trade embargo.  
c. And Wong Kwan will be lucky to **break** even.

**Complex VPs.** That is, VPs where the verbal head is accompanied by auxiliaries and related particles. The tag extends only over the verbal head. In the following examples, the span of the verbal construction is underlined, whereas the extent of the event tag is marked in bold face.

- (42) a. Amir may have been **trying** to **impress** Har-Shefi.  
b. Israel has been **scrambling** to **buy** more masks abroad.  
c. No injuries were **reported**.  
d. The private sector could **establish** a private agency.  
e. Kaufman did not **disclose** details of the deal.

**Phrasal verbs.** Phrasal verbs are also known as *verb-particle constructions*. Only the verbal part (and not its particle) is marked up:

- (43) Additional distribution centers would be **set up** next week.

**Idioms.** Only the main verbal predicate will be tagged as event, as indicated below in bold face.

- (44) Even more hard drives **kick** the bucket.

## 4.2 Events expressed by NPs

As in the case above, the general rule here is to *mark up only the noun head of the NP*. The following cases can be distinguished.

**Regular NPs.** The event tag extends only over the head noun, disregarding any determiners, specifiers, complements, or modifiers. In the following examples, the NP is indicated by square brackets, whereas the event-markable expression is in bold face.

- (45) a. [The financial **assistance** from the World Bank and the International Monetary Fund] are not helping.  
b. [The Pope's **visit**] will persuade a great many more Cubans to break loose of the Cuban government.

**Named events.** They are events referred to by proper nouns, such as *the Vietnam War*, *Prohibition*, *the Industrial Revolution*. We will mark-up only the head noun (i.e., *War*, *Prohibition*, and *Revolution* in the previous examples).

**Sortal states.** As seen earlier, sortal states are generally expressed by (a) agentive nominals (e.g., *employer*, *passenger*, *winner*, *customer*); (b) nouns denoting professions, roles, or positions (e.g., *doctor*, *plumber*; *CTO*, *scholar*); and (c) rigid designators (e.g., *the 3rd president of America*). As in the previous cases, we will annotate only the head noun of the construction (in bold face below).

- (46) a. Dr. Carolyn Waters became the **conductor** of the orchestra in 1992.  
b. Mr. Hay continued as the **CTO** of OPTIM.  
c. In 1998 she retired as a **professor** emeritus of mathematics.

## 4.3 Events expressed by APs

Like VPs and NPs, event-denoting *APs will have only their head adjective annotated as the event*. In the following sentences, the extent of the AP is indicated by brackets, whereas the markable event is in bold face.

- (47) a. Ms. Sanders was hit several times and was pronounced [**dead**] at the scene.  
b. Pol Pot is considered [**responsible** for the radical policies that led to the deaths of as many as 1.7 million Cambodians].

#### 4.4 Events expressed by PPs

When an event is expressed by means of a PP, *only the head preposition is annotated as the event*. In the examples that follow, the extent of the PP is indicated by brackets, while the markable event is in bold face.

(48) All 75 people that were [**on** board the Aeroflot Airbus] died.

Note that not all PPs which denote events will have its preposition head tagged as such, but the verb, noun, or adjective head of the complement of that preposition instead, whenever this is the element conveying the event. We mark up the head preposition only *in case the verb, noun, or adjective head within the PP does not denote the event itself*. The following are examples where the element to be tagged as event is the head of the preposition complement (underlined), and not the preposition (bold face). Example (49) illustrates the case for verbs, (50) for nouns, and (51) for adjectives.

(49) He glared at Conroy [**without** seeing him] and charged back.

(50) The programme began [**with** an interview with someone from that TV series].

(51) He is often characterized [**as** eccentric].

#### 4.5 Events expressed by OTHER ELEMENTS

**Locative adverbs.** The locative adverb will be annotated as event.

(52) a. We're **there** to stay for a fairly lengthy period.

b. We are **here** because what happens on this island will also have an impact on the United States.

#### 4.6 Complex event constructions

In the previous sections, we have seen several constructions which involve two event expressions (e.g., copulative, aspectual, or inchoative constructions). In some cases, both of them are verbs. In others, NPs, APs, and PPs are also involved. Please, be aware that this section will need to be taken into consideration when annotating events belonging to any of the part of speech categories detailed in the preceding sections.

The following subsections provide systematic guidelines on how to mark up these constructions. In order to facilitate their annotation, the table in appendix B summarizes these guidelines into a convenient chart.

### 4.6.1 Copulative constructions

Copulative constructions are VPs headed by verbs like *be* or *seem*, and which have an NP (53), AP (54), or PP (55) as complement.

(53) An eminent Indian origin woman [**is**] the new [*head*] of the British Medical Association.

(54) If, in spite of everything, we will not [**be**] [*ready*], we will ask the United States to delay the operation.

(55) Zarei [**was**] [*in*] charge of a program to clean cities from corruption.

In these constructions, both the verbal predicate and the predicative complement will be marked up. All of the involved elements (verb, NPs, APs, or PPs) will be annotated according to the rules specified in the previous sections. In the examples above, the copulative predicate is in bold face, its complement head in italics, and the elements to annotate are delimited with square brackets.

### 4.6.2 Aspectual constructions

These consist of an aspectual verb (e.g., *begin*, *stop*, *end*, *keep*) or noun (*beginning*, *ending*), and an event-denoting complement, which can be expressed by either a VP (56a-b) or an NP (56c). Both the aspectual predicate and its complement will be tagged as independent events.

In the sentences below, the aspectual predicate is in bold face, its complement head in italics, and the two elements to annotate are delimited by square brackets. The sentences in (56) illustrate cases in which the aspectual predicate is a verb, whereas the sentences in (57) exemplify cases involving aspectual nouns.

(56) a. US did not [**stop**] [*interfering*] in other countries' policies.

b. They probably would have [**began**] [*responding*] to President Reagan's 600 ships plan with new construction.

c. In 1939, Bohannon [**began**] the [*construction*] of Hillsdale.

(57) a. The banks must wait at least 30 days before [**closing**] the [*purchase*].

b. The [**outbreak**] of holy [*war*] could bring thousands of Americans home in coffins.

c. Mr. Bush and his aides were leaning toward a military [**conclusion**] of the [*crisis*].

### 4.6.3 Inchoative constructions

Inchoative constructions in English express the coming to existence of a situation. They generally involve the presence of verbs like *become* and *get*, in addition to their complement, which denotes the resulting situation or process.

Both the inchoative predicate (in bold face) and the complement expressing the resulting situation (in italics) will be annotated as events:

- (58) a. They aren't being allowed to leave and could [**become**] [*hostages*].  
b. The President Ilham Aliyev [**got**] [*acquainted*] with reconstruction works in Vahid garden and National Park.  
c. The public clamor was so great that they [**got**] [*scared*] and a substitute was adopted appointing a committee to investigate the property.

### 4.6.4 Light verb constructions

These involve a verb of very light semantic content (e.g., *make*, *get*, *do*, *have*, *take*, *put*, *set*, *let*) and a nominal event acting as its selected complement. In these situations, both the verbal and nominal elements are tagged as events. Below, the light verb is in bold face whereas the nominal is in italics.

- (59) a. Several pro-Iraq [*demonstrations*] have [**taken**] place in the last week.  
b. They will definitely [**take**] into [*consideration*] our readiness.

### 4.6.5 Causative constructions

Causal constructions involve one of the following causative predicates, or similar ones, in their causative senses: *cause*, *stem from*, *lead to*, *breed*, *engender*, *hatch*, *induce*, *occasion*, *produce*, *bring about*, *produce*, *secure*. Two different constructions can be distinguished here:

1. **EVENT**<sub>*e*1</sub> **cause**<sub>*e*2</sub> **EVENT**<sub>*e*3</sub>. The causal expression (*e*<sub>2</sub>), its logical subject (*e*<sub>1</sub>) and its event complement (*e*<sub>3</sub>) are tagged as independent events –indicated with square brackets in the example below.

(60) The [**rains**<sub>*e*1</sub>] [**caused**<sub>*e*2</sub>] the [**flooding**<sub>*e*3</sub>].

2. **ENTITY** **cause**<sub>*e*1</sub> **EVENT**<sub>*e*2</sub>. Both the causal expression (*e*<sub>1</sub>) and its event complement (*e*<sub>2</sub>) are tagged as independent events.

(61) John [**caused**<sub>*e*1</sub>] the [**fire**<sub>*e*2</sub>].

### 4.6.6 Constructions with functional nouns

Examples of functional nouns are: *temperature, size, weight, population, intensity*, etc. They take an individual as argument (denoting, e.g., a person, physical location, group of individuals, etc.) and return a specific value on an appropriate scale, which can be numeric or not (e.g., *high, low; big, small; hot, cold*; etc.). Functional nouns can appear in three different constructions. In all of them, the functional noun will be marked up as event, together with the main verb of its main clause. Some examples are provided below for different types of constructions, where all the markable expressions are in square brackets. In addition, the functional noun is in bold face and the main verbal predicate of its clause, in italics.

1. **NOUN<sub>functional</sub> *is* X.**

- (62) a. The current USA [**population**] [*is*] above 300 million.  
b. An appraisal of the house indicated its market [**value**] [*is*] \$150000.

2. **INDIVIDUAL *has* a NOUN<sub>functional</sub> of X.**

- (63) a. Catalonia [*has*] a [**population**] of around 7 million people.  
b. This noise originated from cosmic radiation and [*had*] a [**temperature**] of 3 K.

3. **NOUN<sub>functional</sub> *changes/raises/drops/increases/...* (from X) (to Y).**

- (64) In the nine months, [**net**] [*rose*] 4.3% to \$525.8 million, from \$504.2 million last year.

### 4.7 Multiword expressions

We consider as multiword expressions the following constructions:

- **Phrasal verbs** –or equivalently, verb-particle constructions (refer to section 4.1)
- **Idioms** (section 4.1).
- **Named events** expressed by several lexical items; e.g., *The Civil War* (section 4.2).
- **Sortal states** expressed by several lexical items; e.g., *professor emeritus of mathematics* (section 4.2).

The tag extent will comply with the general guidelines for annotating VPs, NPs, APs, and PPs. However, the annotator will indicate that the event is expressed by means of a multiword expression (see the annotation tool manual for further details).

## 4.8 Expressions referring to several event instances

Some event-denoting expressions refer to two or more instances of the same event type. For example, sentence (65) has only one verb (in bold face) which nevertheless denotes two separate events, each of them anchored to a different temporal expression –i.e., *Monday* vs. *Tuesday*.

(65) John **taught** on Monday and Tuesday.

Another example:

(66) John **taught** twice on Monday.

In the case of events denoted by nouns, multiple instances can be expressed with the use of plural:

(67) This February, after several **delays**, the Hammersmith Hospital registrar admitted that he couldn't promise anything before 1993.

Because there is only one expression, we can introduce only one event tag, even though there is need for more than one event reference. We will mark the event expression following the guidelines just presented for annotating event extents, and then indicate how many event instances the expression is referring to. If the precise number is not clear (for instance, in the case of plural nouns, as in example (67) above), we will write down the comment: **cardinality=plural** –note that it contains no blank spaces, and it is all in lower case. For further details, refer to the annotation tool manual.

## 5 Event attributes

There are nine different attributes which need to be annotated for the event tag.

1. Class
2. Part-of-speech (**pos**)
3. Tense
4. Aspect
5. Polarity
6. Modality
7. Type
8. Genericity
9. Cardinality

The function and possible values which each of these attributes can hold are laid out in the following subsections.

## 5.1 Class

Each event should be marked up as belonging to one of the following classes:

- Reporting
- Perception
- Aspectual
- L\_action
- L\_state
- State
- Occurrence

Note, however, that, due to the polysemous nature of words, the same predicate can often be classified in different ways, depending on the context in which it is used. The following subsections describe each class in detail.

**Reporting.** Reporting events describe the action of a person or an organization declaring something, narrating an event, informing the addressee(s) about a situation, and so on. Some verbs which express this kind of event are *say*, *report*, *tell*, *explain*, and *state*.

- (68) a. Punongbayan **said** that the 4,795-foot-high volcano was spewing gases up to 1,800 degrees.  
b. No injuries were **reported** over the weekend.  
c. **According** to President Obama, the plan will double the U.S. capacity to generate renewable energy.

**Perception.** This class includes events involving the physical perception of another event. Such events are typically expressed by verbs like *see*, *watch*, *glimpse*, *behold*, *view*, *hear*, *listen*, and *overhear*.

- (69) a. Witnesses tell Birmingham police they **saw** a man running.  
b. "You can **hear** the thousands of small explosions down there", a witness said.

**Aspectual.** In languages such as English and French, there is a grammatical device of aspectual predication for focusing on different parts of the temporal structure of a given event, including the event's beginning, intermediate, or final part. This device consists on a predicate which selects an event as its argument, and points to some structural aspect of the event. Note that this predicate can be either a verb (e.g. *begin*) or a noun (e.g. *beginning*). We will classify as aspectual events those predicates expressing:

- Initiation: *begin*, *start*, *commence*, *set out*, *set about*, *lead off*, *originate*, *initiate*.
- Reinitiation: *restart*, *reinitiate*, *reignite* (in its metaphoric sense, as in *That speech reignited the senator's campaign.*).

- Termination: *stop, end, halt, terminate, cease, discontinue, interrupt, quit, give up, abandon, block, break off, lay off, call off, wind up.*
- Culmination: *finish, complete.*
- Continuation: *continue, keep, go on, proceed, go along, carry on, uphold, bear on, persist, persevere.*

A couple of examples:

- (70) a. The volcano **began** showing signs of activity in April for the first time in 600 years,...
- b. All non-essential personnel should **begin** evacuating the sprawling base.

***I\_Action.*** **I\_Action** stands for *intensional action*. **I\_Actions** are dynamic events selecting for an event-denoting argument, which must be explicitly present in the text. The label *intension* is used for historical reasons here, and **I\_Actions** and **I\_States** actually cover more than would be denoted by *intension*.

The class **I\_Action** compares with classes **Reporting**, **Perception**, **Aspectual**, and **I\_State** (this last one described next) in that all five refer to events that select a second event as a complement, where this second event is commonly expressed by a subordinated clause, a nominalization, or an untensed VP.

Nevertheless, classes **Reporting**, **Perception**, and **Aspectual** differ from **I\_Action** due to their very specific semantics. And **I\_Actions** and **I\_States** can be distinguished by the fact that the former are dynamic events, whereas the second are stative.

For the most part, the events that should be tagged as **I\_Actions** form a closed class. The following list, where **I\_Actions** are in bold face and the events they select for are underlined, is representative (but not exhaustive) of the types of events included in this class:

- *attempt, try, scramble:*

(71) a. Companies such as Microsoft or a combined worldcom MCI are **trying** to monopolize Internet access.

b. Israel has been **scrambling** to buy more masks abroad.
- *investigate, investigation, look at, delve:*

(72) a. The Organization of African Unity will **investigate** the Hutu-organized genocide of more than 500,000 minority Tutsis.

b. A new Essex County task force began **delving** Thursday into the slayings of 14 black women.
- *delay, postpone, defer, hinder, set back:*

(73) Israel will ask the United States to **delay** a military strike against Iraq.
- *avoid, prevent, cancel:*

(74) Palestinian police **prevented** a planned pro-Iraq rally by the Palestinian Professionals' Union.

Explicit performative predicates like some of those exemplified below (e.g., *ask*, *order*, *authorize*, *claim*, etc.) are also included here.

- *ask, order, persuade, request, beg, command, urge, authorize:*

(75) a. Iraqi military authorities **ordered** all Americans and Britons in Kuwait to assemble at a hotel.

b. They were **asked** to take along important papers.

- *promise, offer, assure, propose, agree, decide:*

(76) Germany has **agreed** to lend Israel 180,000 protective kits against chemical and biological weapons, and Switzerland **offered** to lend Israel another 25,000 masks.

- *swear, vow.*

- *name, nominate, appoint, declare, proclaim.*

- *claim, allege, suggest.*

**I\_State.** **I\_State** stands for *intensional state*. Like **I\_Actions**, **I\_State** events select an argument that expresses any sort of event. Unlike **I\_Actions**, however, the **I\_State** class is used for events which are states.

Also like **I\_Actions**, the event complement selected by **I\_States** can be expressed by subordinated clauses (77-78), nominalizations (79), or untensed VPs (80)

(77) Russia now **feels** [the US must hold off at least until UN secretary general Kofi Annan visits Baghdad].

(78) Once they get that extinguished, they **hope** that [residents will begin returning to their homes].

(79) “There is no reason why we would not be **prepared** for [an attack]”.

(80) The agencies fear they will be **unable** [to crack those codes to eavesdrop on spies and crooks].

The following list of **I\_State** predicates is, once again, representative but not exhaustive.

- *believe, think, suspect, imagine, doubt, feel, be conceivable, be sure:*

(81) a. “We **believe** that [his words cannot distract the world from the facts of Iraqi aggression].”

b. Analysts also **suspect** [suppliers have fallen victim to their own success].

c. Russia now **feels** [the US must hold off at least until UN secretary general Kofi Annan visits Baghdad].

- d. It is **conceivable** that [a larger eruption will take place in few hours].
  - e. He said he was **sure** that [a larger eruption would happen].
- *want, love, like, desire, crave, lust:*
    - (82) a. “They don’t **want** [to play with us],” one U.S. crew chief said.
    - b. We aim at triggering associations that will generate **lust** for [change].
    - c. An occupation Israel would **love** [to end], but ...<sup>4</sup>
  - *hope, expect, aspire, plan:*
    - (83) a. “We’re **expecting** [a major eruption],” he said in a telephone interview early today.
    - b. Once they get that extinguished, they **hope** that [residents will begin returning to their homes].
    - c. We **aim** at [triggering associations that will generate lust for change].
  - *fear, hate, dread, worry, be afraid:*
    - (84) a. The agencies **fear** [they will be unable to crack those codes to eavesdrop on spies and crooks].
    - b. They were **afraid** [to stay].
  - *need, require, demand*
  - *be ready, be eager, be prepared*
    - (85) a. The young industry’s rapid growth also is attracting regulators **eager** [to police its many facets].
    - b. “There is no reason why we would not be **prepared** for [an attack].”
  - *be able, be unable*
    - (86) The agencies fear they will be **unable** [to crack those codes to eavesdrop on spies and crooks].

**State.** States describe *circumstances* in which something obtains or holds true. Note that the class **State** does **not** contain states that have been tagged as **LStates**. Some examples appear in bold face below:

- (87) a. It is the US economic and political **embargo** which has **kept** Cuba **in** a box.
- b. Colonel Collins has **been** the **co-pilot** before, but this time she **is** the **boss**.
- c. Worries however grew about the **safety** of Americans and other Westerners **trapped** in Iraq and Kuwait.
- d. Iraq **has** 17 million residents.

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<sup>4</sup>Note that since all **I\_State** events necessarily require an event-denoting complement, an example like *John loves Paul’s cousin* would not be considered an **I\_State**.

**Occurrence.** This class includes all of the many other kinds of events that describe something that happens or occurs in the world. Some examples are given as illustration:

- (88) a. The Defense Ministry said 16 planes have **landed** so far with protective equipment against biological and chemical warfare.
- b. Mordechai said all the gas masks from abroad would **arrive** soon and be **distributed** to the public, adding that additional distribution centers would be **set** up next week.
- c. Two moderate **eruptions** shortly before 3 p.m. Sunday appeared to **signal** a larger **explosion**.

## 5.2 Part of Speech

This attribute captures syntactic distinctions among the expressions that are marked as events. It can have the following values: **VERB**, **NOUN**, **ADJECTIVE**, **PREP**, **OTHER**, which are distinguished using standard criteria in linguistics.

The overall annotation task is structured into subtasks based on the part of speech of event expressions. For that purpose, there has been a prior, automatic process of part of speech tagging. The result of this processing will be presented in the annotation tool as the default value of the **part of speech** attribute. However, annotators will have to change this value in case it is not correct.

Below, we provide some examples of each part-of-speech for the sake of guidance:

1. **Verbs:** Including both finite and non-finite forms. Sentences in the first example have finite forms signaled in bold face, whereas those in the second illustrate the use of non-finite forms.

- (89) a. A fresh flow of lava, gas and debris **erupted** there Saturday.
- b. Amir may have been **trying** to impress Har-Shefi.

- (90) a. King Hussein arrived in Washington yesterday **seeking** to **gain** support for a new initiative.
- b. Prime Minister Benjamin Netanyahu called the prime minister of the Netherlands **thank** him for thousands of gas masks.

2. **Nouns:**

- (91) a. Israel will ask the United States to delay a military **strike** against Iraq until the Jewish state is fully prepared for a possible Iraqi **attack**.
- b. King Hussein arrived in Washington yesterday seeking to gain **support** for a new **initiative**.

3. **Adjectives:**

- (92) a. A Philippine volcano, **dormant** for six centuries, began exploding with searing gases, thick ash and deadly debris.

- b. There is no reason why we would not be **ready**.

#### 4. Prepositions:

- (93) a. All 75 people **on** board the Aeroflot Airbus died.  
b. No woman has been **in** charge of a mission until now.  
c. Ogden Projects closed yesterday **at** \$26.875, down 75 cents.  
d. She says this puts the very existence of women's families **at** risk.

#### 5. Other: Including locative adverbs.

##### *Locative adverbs:*

- (94) a. We're **there** to stay for a fairly lengthy period.  
b. We are **here** because what happens on this island will also have an impact on the United States.

### 5.3 Tense, Aspect

The **tense** and **aspect** attributes capture standard distinctions among the grammatical categories of verbal phrases. The **tense** attribute can have any of the following values:

- **PRESENT**: for events that occur at the time of the speech act.
- **PAST**: for events that occurred before the speech act.
- **FUTURE**: for events that will occur after the speech act.
- **INFINITIVE**: for events marked with infinitival *to*.
- **PRESPART**: for forms marked with *-ing* and not preceded by the progressive auxiliary *be*.
- **PASTPART**: for past participle forms (many of which take an *-ed* or *-en* suffix) which are not preceded by the perfective auxiliary *have* or the passive auxiliary *be*.
- **NONE**: for forms which appear in the bare form, such as immediately following a modal auxiliary like *can* or *would*.

On the other hand, the **aspect** attribute can have the following values:

- **PROGRESSIVE**: for events which can generally be described as continuous or ongoing, marked with the auxiliary *be* plus a verb taking an *-ing* suffix.
- **PERFECTIVE**: for events which can generally be described as completed, marked with the auxiliary *have* plus a past participle verb form (often taking an *-ed* or *-en* suffix).

- **PERFECTIVE\_PROGRESSIVE**: for events which are marked for both perfective and progressive.
- **NONE**: for events which are in the simple present, past, or future, with no progressive or perfective marking.

What follows provides some guidelines for choosing among the possible **tense** and **aspect** values.

### 5.3.1 Finite Verbs

**Tense** and **aspect** attributes will be established as indicated in the following examples:

#### 1. Active Voice.

<b>tense=“PRESENT”</b>	
<b>Verb group</b>	<b>aspect=</b>
<i>teaches</i>	NONE
<i>is teaching</i>	PROGRESSIVE
<i>has taught</i>	PERFECTIVE
<i>has been teaching</i>	PERFECTIVE_PROGRESSIVE
<b>tense=“PAST”</b>	
<b>Verb group</b>	<b>aspect=</b>
<i>taught</i>	NONE
<i>was teaching</i>	PROGRESSIVE
<i>had taught</i>	PERFECTIVE
<i>had been teaching</i>	PERFECTIVE_PROGRESSIVE
<b>tense=“FUTURE”</b>	
<b>Verb group</b>	<b>aspect=</b>
<i>will teach</i>	NONE
<i>is going to teach</i>	NONE
<i>will be teaching</i>	PROGRESSIVE
<i>is going to be teaching</i>	PROGRESSIVE
<i>will have taught</i>	PERFECTIVE
<i>will have been teaching</i>	PERFECTIVE_PROGRESSIVE

#### 2. Passive Voice.

<b>tense=“PRESENT”</b>	
<b>Verb group</b>	<b>aspect=</b>
<i>is taught</i>	NONE
<i>is being taught</i>	PROGRESSIVE
<i>has been taught</i>	PERFECTIVE
<b>tense=“PAST”</b>	
<b>Verb group</b>	<b>aspect=</b>

<i>was taught</i>	NONE
<i>was being taught</i>	PROGRESSIVE
<i>had been taught</i>	PERFECTIVE

tense=“FUTURE”

<b>Verb group</b>	<b>aspect=</b>
<i>will be taught</i>	NONE
<i>is going to be taught</i>	NONE
<i>will have been taught</i>	PERFECTIVE

### 5.3.2 Verbs preceded by a modal auxiliary

Two different cases are described here:

1. **Verbs preceded by *have to* or *ought to*.** Although *have to* and *ought to* are technically not modals, they should be treated and tagged as modals.<sup>5</sup> The characterization of **tense** and **aspect** for *have to* and *ought to* will be very similar to **tense** and **aspect** for finite verbs. Follow the examples below:

tense=“PRESENT”

<b>Verb group</b>	<b>aspect=</b>
<i>has to teach</i>	NONE
<i>has to be teaching</i>	PROGRESSIVE
<i>has to have taught</i>	PERFECTIVE
<i>has to have been teaching</i>	PERFECTIVE_PROGRESSIVE

tense=“PAST”

<b>Verb group</b>	<b>aspect=</b>
<i>had to teach</i>	NONE
<i>had to be teaching</i>	PROGRESSIVE

tense=“FUTURE”

<b>Verb group</b>	<b>aspect=</b>
<i>will have to teach</i>	NONE
<i>will have to be teaching</i>	PROGRESSIVE

2. **Verbs preceded by any other modal auxiliary.** Modal auxiliaries in this group include: *must*, *may*, *might*, *can*, *could*, *shall*, *should*, and *would*. In this case, attribute **tense** will be **tense=“NONE”** The value for **aspect** will be assigned according the following examples:

tense=“NONE”

<b>Verb group</b>	<b>aspect=</b>
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<sup>5</sup>Note, however, that *need to*, *be allowed to*, and *be able to* should **not** be treated or tagged as modals.

<i>could teach</i>	NONE
<i>could be teaching</i>	PROGRESSIVE
<i>could have taught</i>	PERFECTIVE
<i>could have been teaching</i>	PERFECTIVE_PROGRESSIVE

### 5.3.3 Non-finite Verbs

A range of subordinate clauses in English contain non-finite verbs. These include infinitival and participial clauses. Some examples are given below.

**1. Present Participle.** Some examples illustrating the use of this form are:

- (95) a. King Hussein arrived in Washington yesterday **seeking** to gain support for a new initiative.  
 b. She came home **wanting** a sandwich.  
 c. The kids **asking** for sandwiches are inside.

Present participle forms can occur also in progressive constructions in which the main verb ends in *-ing* and is preceded by a form of the verb *be* (e.g. *Sara is sleeping*). There are also noun uses (as in **Rowing is fun**) and adjective uses (as in *That's an **inviting** idea*).

However, the **PRESPART** marking is intended for those cases in which the form occurs in a subordinate clause and it is not preceded by the verb *be*, as in examples (95). It should also be used when it cannot be clearly determined whether the form corresponds to a present participle (and hence is a verb), an adjective, or a noun. Attribute **tense** is set to **PRESPART** and attribute **aspect** to **NONE**:

<b>tense=</b> ' 'PRESPART'		<b>aspect=</b>
<b>Verb group</b>		<b>NONE</b>
<i>seeking</i>		

**2. Past Participle.** Some examples are:

- (96) a. Steel plates **found** at the scene are being examined by experts.  
 b. We catalogued the books **left** behind by the guests.  
 c. The memo was sent to candidates **nominated** by the committee.

Like present participle forms, past participles can also be used as part of passive or perfective constructions. Moreover, they also have uses in which they should be marked as adjectives, e.g. *He seems **confused***.

Nevertheless, the **PASTPART** marking is intended for those cases in which the participle occurs in a subordinate clause and it is not preceded by any auxiliary form indicating either passive voice or perfective construction, as shown in examples (96). It should also be used

when the participle cannot be clearly determined to be in either of the other categories. Attribute **tense** is set to PASTPART and attribute **aspect** to NONE:

<b>tense=</b> ‘ PASTPART ’		
<b>Verb group</b>		<b>aspect=</b>
<i>found</i>		NONE

### 3. Infinitive. Some examples are:

(97) Callahan plans to **release** the information today.

Attribute **tense** is set to INFINITIVE, while attribute **aspect** can receive any of its possible values, as indicated below:

<b>tense=</b> “INFINITIVE”		
<b>Verb group</b>		<b>aspect=</b>
<i>(to) release</i>		NONE
<i>(to) be releasing</i>		PROGRESSIVE
<i>(to) have released</i>		PERFECTIVE
<i>(to) have been releasing</i>		PERFECTIVE.PROGRESSIVE

#### 5.3.4 Nouns

**Tense** and **aspect** attributes for nouns will have the NONE value.

**tense=**“NONE”, **aspect=**“NONE”

##### Examples

*The **threat** caused considerable attention.*

*This is/was/will be an **attempt** to open negotiations.*

*He is/was being a **nuisance**.*

*This has/had been/will have been a **concern** for many months.*

#### 5.3.5 Adjectives

Like with nouns, **tense** and **aspect** for adjectives will always have the NONE value. The following examples illustrate:

**tense=**“NONE”, **aspect=**“NONE”

##### Examples

*The suspect, **unwilling** to talk, ...*

*Her spouse is/is being/has been **unwilling** to talk.*

*Her spouse was/was being/had been **unwilling** to talk.*

*Her spouse will be/will have been **happy** to talk.*

### 5.3.6 Prepositional Phrases

Similarly to the adjectives and nouns, the **tense** and **aspect** attributes for prepositional phrases will be set to NONE.

tense=“NONE”, aspect=“NONE”

#### Examples

Thomson, **in** India to talk to tourism leaders, ...

The project is/was/will be **in** trouble.

That kid is/was being/ **out** of control a lot lately.

The project has/had been/will have been **in** trouble for many months.

### 5.3.7 Other Elements

For other elements, the **tense** and **aspect** attributes will both be set to NONE.

tense=“NONE”, aspect=“NONE”

## 5.4 Polarity

The polarity of an event instance is a required attribute represented by the boolean attribute **polarity**. **Polarity** should be set to *negative* for event instances which are negated. This should be done for any negative example, such as:

- (98) a. They did not/didn't **finish** the article.
- b. We never **finish** dinner.
- c. No one **came**.

**Polarity** should be set to **positive** otherwise.

## 5.5 Modality

The **modality** attribute is only specified if there is a modal word (i.e. *may, might, must, would, should, could, can, ought to, have to, or shall*) that modifies the instance. So, the events in bold face in the following sentences:

- (99) a. John should **leave** tonight.
- b. They can't have **been** early.
- c. We might **be** there soon.

will all have the **modality** attribute with a non-empty value, which will correspond to the literal string of the modal auxiliary form.

Sentences that lack a modal will not receive any value for this attribute.<sup>6</sup>

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<sup>6</sup>Recall from above that, though they are not technically modals, *ought to* and *have to* should be treated and tagged as modal words. In contrast, *need to*, *be allowed to*, and *be able to* should **not** be treated or

## **5.6 Type**

Attribute not applicable for the Tempeval 2010 annotation task.

## **5.7 Genericity**

Attribute not applicable for the Tempeval 2010 annotation task.

## **5.8 Cardinality**

Attribute not applicable for the Tempeval 2010 annotation task.

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tagged as modals.

## A Event-denoting expressions

Table 1 summarizes what expressions can be marked up as events, classified by part-of-speech. Code  $\forall$  means *in all cases*, code  $\exists$  means *only in some cases*, and code  $\emptyset$  means *never*. A small comment is added when considered necessary.

Table 1: When to annotate event-denoting expressions.

Construction	Annotate	Comment
<b>Vs</b>	$\forall$	
<b>Ns</b>		
<i>Prenominal modifiers:</i>	$\emptyset$	Annotated when functioning as the head of a predicative complement.
<i>Sortal states:</i>	$\exists$	
<i>Others:</i>	$\forall$	
<b>Adjs</b>		
<i>Attributive adjectives:</i>	$\emptyset$	Annotated when expressing a non-persistent property; i.e., a property that: – is clearly fluid; or – is temporally bound; or – is presented as the opinion of somebody.
<i>Predicative adjectives:</i>	$\exists$	
<b>PPs</b>		
<i>Predicative complements:</i>	$\forall$	
<i>Other:</i>	$\emptyset$	
<b>Locative adverbs:</b>		
<i>Predicative complements:</i>	$\forall$	
<i>Other:</i>	$\emptyset$	

## B Complex event constructions

Table 2 lists the different complex constructions identified in section 4.6, and indicates what constituents of these constructions need to be marked up as events. In the examples column, the elements to be tagged appear underlined.

Table 2: Complex constructions: What elements to annotate.

Construction	What to annotate	Examples
<b>Copulative</b>	Annotate both: – the verbal predicate – the complement	<u>be</u> willing, <u>seem</u> ready, <u>be</u> the head, <u>be</u> CTO, <u>be</u> in charge, <u>be</u> on board.
<b>Aspectual</b>	Annotate both: – the aspectual predicate – the complement	<u>stop</u> interfering, <u>begin</u> the construction, the <u>outbreak</u> of the <u>war</u> .
<b>Inchoative</b>	Annotate both: – the inchoative predicate – the complement	<u>become</u> hostage, <u>get</u> acquainted, <u>get</u> scared.
<b>Light verb</b>	Annotate both: – the light verb – the nominal complement	<u>have</u> a bath <u>take</u> into consideration, <u>make</u> conversation.
<b>Causal</b>	Annotate the underlined elements: – EVENT <u>causes</u> EVENT – ENTITY <u>causes</u> EVENT	The rains <u>caused</u> the flooding. John <u>caused</u> the fire.
<b>Functional Nouns</b>	Annotate the underlined elements: – N <sub>funct</sub> <u>is</u> X – ENTITY <u>has</u> a N <sub>funct</sub> of X – N <sub>funct</sub> <u>change-of-state</u> X (PP <sub>from</sub> ) (PP <sub>to</sub> )	The US population <u>is</u> 300M. The US <u>has</u> a <u>population</u> of 300M. <u>Net</u> <u>rose</u> 43% <u>from</u> 60M.

## References

- Pustejovsky, J., Knippen, B., Littman, J., & Saurí, R. (2005). Temporal and event information in natural language text. *Language Resources and Evaluation*, 39(2), 123–164.
- Verhagen, M., Gaizauskas, R., Schilder, F., Hepple, M., Katz, G., & Pustejovsky, J. (2007). Semeval-2007 task 15: Tempeval temporal relation identification. In *Proceedings of the Fourth International Workshop on Semantic Evaluations (SemEval-2007)*, (pp. 75–80)., Prague, Czech Republic. Association for Computational Linguistics.
- Verhagen, M., Gaizauskas, R., Schilder, F., Hepple, M., Moszkowicz, J., & Pustejovsky, J. (2009). The tempeval challenge: identifying temporal relations in text. *Language Resources and Evaluation*.