Newsletter, Issue 1

21/12/2017

AffectUs is an extension module for the TIS platform, that aims to cover a set of functionalities aiming to

- Detect abnormal conditions with relation to the state of a supply chain, based on models created from historical data regarding transition times from stage to stage
- Link and forward externally identified generic events (coming from open data sources, smart city data and external developers) to affected entities of the chain
- Increase link between verticals through identifying and implementing links between generic events and effects on a given Thing/product

Through the joint usage of semantics, events identification and forwarding, AffectUs may enable this cross-fertilization of event notifications between verticals, thus enriching application context. Automated discovery of what products are affected by the predicted events is part of this process.

Objectives & Technical Challenges

A key aspect of the extension is the ability to combine different data sources in a manner that will concentrate and generate more knowledge and proactive management on behalf of the stakeholders in the system. In order to strengthen these aspects, AffectUs participated in the co-creation workshop of TIS, through the communication with which a number of requirements have been produced. The most important of the latter is to be able to combine not only external data (e.g. weather information) or generic information coming from the tag analysis, such as location, time and tag id in a scan, but also the inner sensor values included in the tags themselves, in order to better illustrate the process of tag usage.

From this interaction as well as from subsequent communications, candidate events have been compiled:

- Events that have to do with delays in the transition between stages of the supply chain and can be detected through the exploitation of historical data
- Abnormal events in the sense of an unfeasible or illegal sequence of appearance, for example:
    - scanned twice at selling point
    - scanned outside a designated region of sale
    - scanned at recycling point while not scanned at selling point
    - scanned at recycling point and then resold at selling point
    - scanned at selling point while scanned in the past and found violation in the temperature threshold. This event also captures the requirement for using the internal sensor values of the tags

The AffectUs project is a TagItSmart (Grant Number 688061) Open Call 1 Extension project co-funded by the European Union (EU) Horizon 2020 program.

- Lack of scan information based on timing limits. Personnel need to be trained and monitored in order not to forget to scan products at designated locations. Lack of scanning may be attributed at some cases also to suspicious behavior or it may be due to simple negligence. Thus relevant notifications should be issued in order to remind about the need to scan at given points in time or location.
- Prediction of generic data series (e.g. containers reaching their maximum capacity at a given recycling point), especially if this is linked to quantities consumed through the previous parts of the chain (e.g. selling points) within the area, or with relation to external weather conditions.

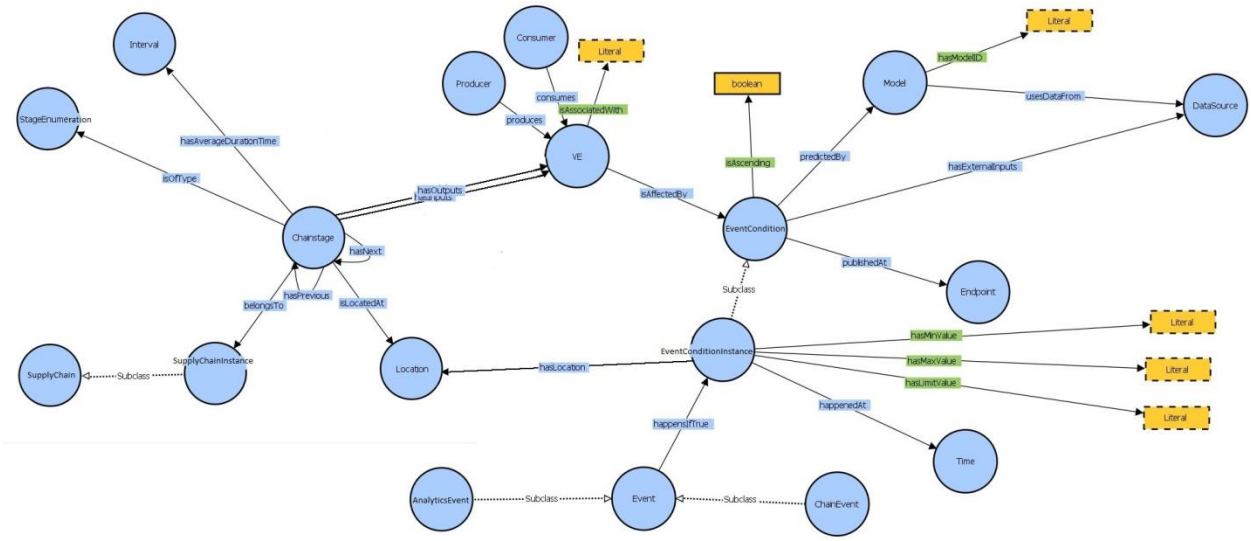

Figure 1 Core Ontology

External data sources that may be used include:

- Social network data usage, in order to detect large crowd concentrations in a given area, that might affect a number of aspects such as:
  - Increased consumption of the given product
  - Increased delays in the transportation phase that include the locations around which the event has been detected
- Weather data that can affect:
  - Transport times
  - Production especially of agricultural products that may be used as raw material in the production of a TIS product

Supply Chain Modelling

In case one needs to build a generic process of a supply chain (Figure 2), the different stages need to be modelled as well as the respective tags that have to do with each part of the chain. Then based on the scanned info, specific statistics per stage can be extracted, such as duration in a stage. Furthermore, based on available scanning of tags per layer, this chain may be simplified (e.g. remove Produced and Packaged) while based on historical data, measured times for transition between stages may be acquired, thus being able to detect an event of Delayed /Normal/AheadOfTime status.

The AffectUs project is a TagItSmart (Grant Number 688061) Open Call 1 Extension project co-funded by the European Union (EU) Horizon 2020 program.

Figure 2 Example of supply chain

Usage of external events and semantic extensions

Event identification coming from external data sources and respective developers is declared to AffectUs using the UI in Figure 3. In this case the events creation developer may declare certain practical aspects of their event, such as detected states, semantic area of the event, endpoint of publication etc. This information is translated into the proper SPARQL queries and inserted in the ontology.

The ontology consists of the ground truths about event and product (metadata), along with the additional information provided by the user. The UI has to intuitively allow a user to add specific information about events and types of products that are of interest, so as to extend the information that can be queried. Reasoning may also play a role here, to validate the users "claims", and possibly find additional information. Then, by using semantic queries, complex logic is simplified. Inferences that come from semantic queries provide knowledge about the types of products that are affected, and how they are affected.

With these rules, the spectrum of products affected is narrowed down to the product (class). Additionally, "conditions" that need to be satisfied at the level of a physical item (unique tag_id), so that the right parties can be alerted or notified about the potential danger, change or happening (event), are available. The conditions are programmatically applied to each arrival of an event.

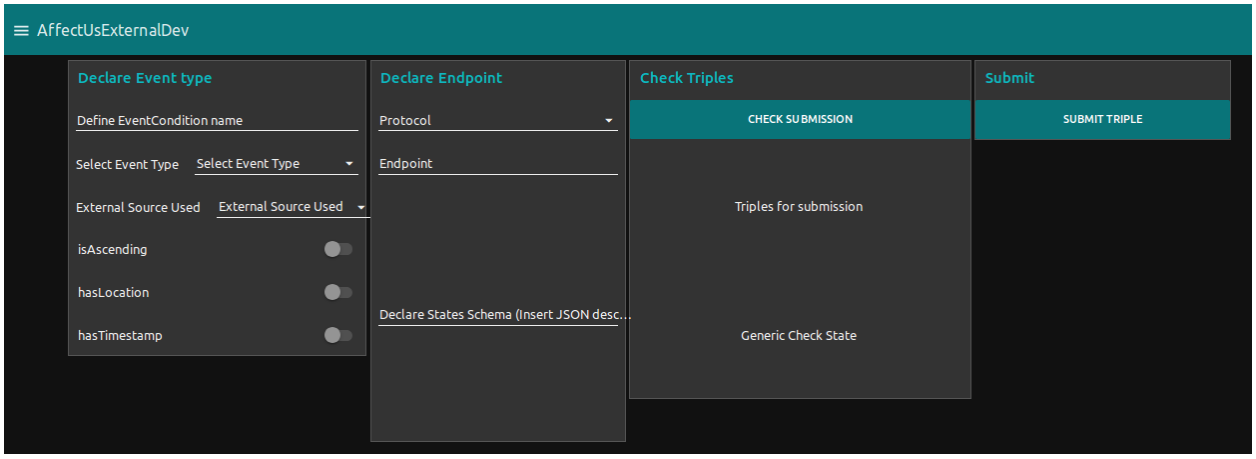

Figure 3: Declaration of event detection from external data sources

We can also use semantic queries to simplify the very instantiation of an event. For example, change in the state of the weather may, or may not be of interest, depending on the specific activity of a user or nature of a product. This is also true about social data, as it may not be known if an analysis has results that are of interest to all parties. To make sure that something may truly affect an entity (product, person etc.) we can use inferencing on semantics in a similar fashion as above, to instantiate an event, which will in turn have a better target spectrum.

So, to generalize, we aim at having a stream of data moving through a workflow (Node-

The AffectUs project is a TagItSmart (Grant Number 688061) Open Call 1 Extension project co-funded by the European Union (EU) Horizon 2020 program.

Red), in which queries (SPARQL) are made to hit the triple store that holds the ontology. The triple store can be enhanced with additional reasoning capability and linkage with data from other sources throughout the web. The inferences returned are used for event processing and directing notifications to the right parties.

Project Partners

Software used for implementation

The AffectUs project is a TagItSmart (Grant Number 688061) Open Call 1 Extension project co-funded by the European Union (EU) Horizon 2020 program.