This work defines a situation aware adaptive event stream processing model and scenario specification language. The processing model and language allow the specification of stream processing tasks, which support an automatic scenario specific adaptation of their processing logic based on detected situations and interim processing results.

The motivation for this work lies in the missing support of current state of the art Event Stream Processing (ESP) systems for such a „situation aware adaptive Event Stream Processing“ which leads to the problem that for each scenario that requires this kind of processing, a new processing system needs to be designed, implemented and maintained. It is therefore the aim of this work to ease the development of such situation aware adaptive processing systems.

An example for such a scenario is the detection and tracing of solar energy production drops caused by clouds shading solar panels as they pass. The scenario requires a processing system to handle large amounts of streaming data to detect a cloud (possible situation). The later verification of the cloud as well as its tracking however only requires a small situation specific subset of the overall streaming data, e.g. the measurements from solar panels of the affected area and its surroundings. This subset changes its characteristics (location, shape, etc) dynamically as the cloud traverses the region. The scenario thus requires a situation aware adaptation of its processing set-up in order to focus on a detected cloud and to track it.

This work approaches the problem by defining a situation aware adaptive stream processing model and a matching scenario definition language to allow the definition of such processing scenarios for a scenario independent processing system. The requirements for the definition of the model and language are the result of an analysis of three distinct scenarios from two application domains. The designed model defines situation aware adaptive processing in three main phases:

**Phase 1:** In the Possible Situation Indication phase, possible situations are detected in a large set of streaming data.

**Phase 2:** The Focused Situation Processing Initialization phase determines whether an indicated possible situation needs to be investigated or if it can be ignored, for example because the situation was already under investigation. If a potential situation needs to be investigated, a new situation specific focused processing is started.

**Phase 3:** In the Focused Situation Processing phase, possible situations are verified and an in depth investigation of the situation including the adaptation of the processing set-up based on interim results is possible.

The evaluation demonstrates that the language and processing model fulfill the defined requirements by providing an application domain and scenario independent mechanism to define and execute situation aware adaptive processing tasks. For the evaluation, a processing system prototype was created and two scenarios from two different domains realized. The first scenario is the Cloud Tracking scenario introduced above. The second scenario is the detection and tracing of Denial of Service Attacks. Several tests where performed to verify that the scenario definition provides the required information for the processing system and to verify that the designed processing model allows the required situation aware adaptive processing on a scenario independent processing system.