**PROASENSE – THE PROACTIVE SENSING ENTERPRISE**

Semantics-based management of fast data streams

ProSense is an EU project aiming at the core goal to pave the way for an efficient transmission from Sensing into Proactive enterprises that will be continuously aware of “what might happen” and optimize their behavior to achieve that what “should be the best action”.

A major challenge in this context is the integration of technically heterogeneous data streams (physical sensors, applications, human sensors), highly distributed stream processors (on-premise vs. off-premise), and actuators (monitoring, decision making).

We present StreamPipes, a semantics-based management framework to control the definition and execution of distributed stream processing pipelines. StreamPipes aims to improve the development of Complex Event Processing-based applications.

### 2. APPROACH: METHODOLOGY

**OBJECTIVES**
- Integration of heterogeneous stream processing logic
- Reduction of development effort for event pattern definition (“time-to-pattern”)

**Setup Phase**
- Targeted at software developers
- Vendor-specific implementation of stream processing elements
- Vendor-independent ontology-based description

**Execution Phase**
- Targeted at non-technical users
- Identification of goals and KPIs
- Pipeline definition
- Pipeline execution

### 3. STREAM PROCESSING PIPELINES

**OBJECTIVE**
Integration of arbitrary event-processing runtime implementations in a dataflow-oriented way

**Approach**
- Pipelines consist of event streams, event processing agents and event consumers
- Pipelines transform one or more input streams to an output stream
- Common semantic description of requirements and capabilities of streaming elements
- Semantics-based matching of pipeline elements
- Instantiation of parameterized event patterns with concrete event streams

### 4. ONTOLOGY

**OBJECTIVE**
Improve reusability of stream processing logic by providing a semantics-based higher-level description

**Event Streams**
- Produced schema: Specification of run-time event payload, linked to ssn:Property to define further properties (e.g., feature of interest)
- Grounding: Specification of run-time messaging format and transport protocol
- Source: further information on the producing Event Processing Agents (EPA)

**Event Processing Agents (EPA)**
- Description of minimum stream-level requirements
- Description of static data that is required for instantiation
- Mapping of event properties to an EPA operation
- Output strategy: Described the transformation type of an EPA

### 5. MANAGEMENT

**OBJECTIVE**
Centralized management framework to control definition and execution of pipelines

**Pipeline Definition**
- Semantics-based matching based on schema, grounding and quality offerings and requirements of stored description graphs
- Matching based on subsumption reasoning
- Recommendation of suitable pipeline elements

**Pipeline Execution**
- Computation of invocation graphs (broker, message format, schema)
- Transmission of individual graphs to EPA destinations, monitoring
- Publication-based message exchange at runtime

### 6. PIPELINE AUTHORIZING

- Drag-and-drop definition of pipelines
- Addition/Removal of pipeline elements at runtime
- Real-time visualizations