|  |  |
| --- | --- |
| **The SENSE Ontology Requirements Specification Document** | |
| **1** | **Purpose** |
|  | The purpose of building the SENSE semantic model is to provide a “common language” for knowledge-driven event explainability for Cyber-Physical Systems (CPS). |
| **2** | **Scope** |
|  | The focus of the ontology is on representing the necessary knowledge to support knowledge-driven event explainability for CPS. The ontology is aimed towards *SENSE system developers* and *adopters* with a high-level of technical capabilities and some knowledge about ontologies and Semantic Web technology stack.  Specifically, the SENSE ontology aims to represent:   * The **topology** of CPS (in-question), including:   + their characteristics, features/functionalities, and components.   + the relation between the components.   + *(!) excluding geolocation information.* * The **state of the CPS** and its components,   + especially focus to temporal aspect.     - *(!) spatial aspect is not the focus.*   + context information, e.g.,     - measurement units, sensor information, measurement types.   + *(!) excluding raw data* * **CPS events**, including:   + System event detection methods (i.e., how-to-detect)   + System event categories/classifications   + System event provenance (i.e., how event instances are detected).   + System event characteristics and properties. * The **causality relations** between system events, including:   + Methods to detect causalities.   + Simple causality between two events (e.g., prevent, cause, enable).   + Composite (complex) causality, i.e., relation between more than two events (e.g., via conjunctive relations)   + *(!) might also cover correlation in the future.* * **Event explanation** and **suggested actions**, including:   + Event explanation types and their derivation methods   + Suggested action types and (optionally) their derivation methods   + Their relations to users/stakeholders (e.g., role, access, types). * The **users/stakeholders**, including:   + User types (e.g., lay users, expert),   + User roles (e.g., manager, admin, car users),   + User access (e.g., access to all data vs partial data) * D**omain-specific terminologies**, including:   + Mapping from specific to the generic terms (e.g., via subsumption relations)   + Mapping of terms from different type of users (e.g., lay-users, technical users, C-level users, etc.) |
| **3** | **Implementation Language (optional)** |
|  | OWL, RDFS, SHACL, (time-series) database schema, STL |
| **4** | **Intended End-Users (optional)** |
|  | TBD: defined as part of the ontology (see user/stakeholders). |
| **5** | **Intended Uses** |
|  | We intend to use the ontology to support various functionalities of the SENSE system, including, but not limited to:   * Event detection * Event causality detection * Event causality derivation/generation. * Event explanation generation * User interactions (e.g., with Chatbot) * Communication between SENSE components * Suggesting actions to end-users |
| **6** | **Ontology Requirements** |
|  | 1. **Non-Functional Requirements** |
|  | 1) The SENSE ontology shall be compliant with one or more existing ontologies in the CPS domain (e.g., SOSA, SSN, BRICK) to ensure applicability and reusability in the broader research and industry community.  2) The SENSE ontology shall be developed in a layered approach. To this end, the preference is to have it in three layers:   * SENSE core – generic for (any) CPS systems. * SENSE domain knowledge (i.e., Smart Grid and Smart Building). * SENSE use-case specific. |
|  | 1. **Functional Requirements: Lists or tables of requirements written as Competency Questions and sentences** |
|  | File: LOT\_UC\_Requirements\_v2.0.0.xlsx |
| **7** | **Pre-Glossary of Terms (optional)** |
|  | 1. **Terms from Competency Questions** |
|  | File: LOT\_MODA\_v2.0.0.xlsx |
|  | 1. **Terms from Answers** |
|  | File: LOT\_MODA\_v2.0.0.xlsx |
|  | 1. **Objects** |
|  | File: LOT\_MODA\_v2.0.0.xlsx |