Ontology Summit 2015
Internet of Things:
Toward Smart Networked Systems and Societies

Synthesis I – February 19, 2015
Track C: Decision Making in Different Domains
Synthesis I

Co-Champions
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Goal and Speakers

- To explore several approaches to automated inference in applications ranging from complex event processing and situation awareness to manufacturing.

- Ontology Based Information Centric Tactical Edge Networking, Joseph Kopena (Bellerophon Mobile)

- From Semantic Complex Event Processing to and Ubiquitous Pragmatic Web 4.0, Adrian Paschke (Freie Universitaet Berlin)

- Process Ontologis for Smart Objects in Manufacturing, Michael Grüninger (University of Toronto)

- Situation Awareness and Decision Making, Ken Baclawski (Northeastern University)

Case Studies

- Military Situation Awareness (Kopena)

- Enterprise Decision Management (Paschke)

- Manufacturing (Grüninger)

- Healthcare (Baclawski)

- Cloud Services (Baclawski)

- Customer Service (Baclawski)

- Financial Services (Baclawski)

Insights/Lessons Learned

- A little semantics goes a long way (Kopena)
  - Potential stakeholders primarily interested in basic taxonomies
- Fairly difficult to get developers without KR experience up to speed (Kopena)
  - Project apps didn't get to point of utilizing capabilities for collaboration, versioning, etc., offered by the underlying model
- Evaluation of KR systems is extremely difficult (Kopena)
  - Performance is non-trivial but fairly straightforward
    - Sidenote: What's hard for network may not be hard for KR, & vice versa
  - Testing actual effectiveness and value requires complex yet realistic scenarios, revolves around metrics that are difficult to quantify
- SPARQL and RDF model aren't quite the right tools for this task (Kopena)
  - SPARQL great for querying the KB, less ideal for fetching objects
    - Apps want all the metadata about content, resulting in massive queries
  - RDF+SPARQL cumbersome when working with dynamic data

Insights/Lessons Learned

- Automated reasoning is difficult! (Grüninger)

  - Some queries could not be answered in the time limit.

  - Approaches are necessary for dealing with this problem.

- Manufacturing processes are complex. (Grüninger)

  - Objects flow through a sequence of processes, and at any point in a process plan, there are multiple activities that can possibly occur next.

  - Process plans may also be nondeterministic.

  - A first-order process ontology can be used to create smart objects that can reason about the manufacturing processes in which the object participates.

  - Eventually, smart items could be dynamically self-routed through the various process plans.

Insights/Lessons Learned

- Complex event processing can benefit from semantics (Paschke)

  - Event data becomes declarative knowledge while conforming to an underlying formal semantics

  - Reasoning over situations and states by event processing agents

  - Better understanding of the relationships between events

  - Declarative knowledge-based processing of events and reactions to situations

- The Pragmatic Web consists of the tools, practices and theories describing why and how people use information. (Paschke)

  - In contrast to the Syntactic Web and Semantic Web the Pragmatic Web is not only about form or meaning of information, but about interaction which brings about e.g. understanding and commitments. [www.pragmaticweb.info]

Insights/Lessons Learned

- Decisions are made within a context (Paschke, Baclawski)

    - Situation Assessment is central to information fusion (Baclawski)

    - Situation Awareness is fundamental part of event processing (Paschke)

- Decisions are made within a process (Paschke, Grüninger, Baclawski)

    - Event Processing (Paschke)

    - Manufacturing Process (Grüninger)

    - OODA Loop, JDL Model, KIDS (Baclawski)

Vision of the future of the Web (from Paschke)