SmartSlog 0.3x:
New Ontology Library API and Optimization

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Smart-M3 Platform

- Smart spaces provide a shared view of resources

- Semantic information brokers (SIBs) maintain smart space content in low-level RDF triples

- Application consists of several knowledge processors (KPs) running on various devices

- Smart-M3: **M**ultidomain, **M**ultidevice, **M**ultivendor
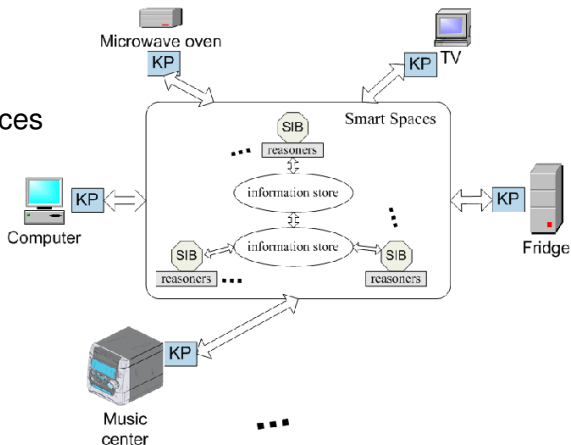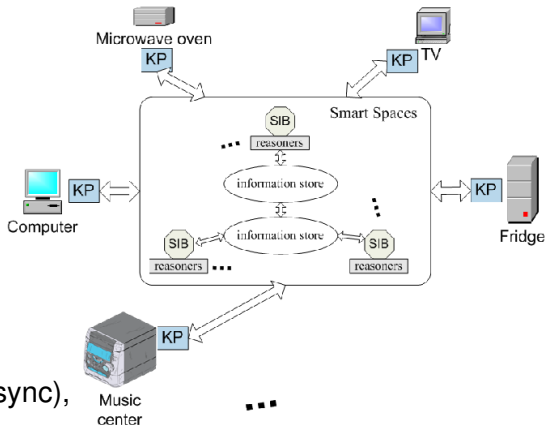
Knowledge Processors

Each KP is an agent
sharing ad-hoc knowledge
across numerous domains

Basic communication
primitives:

- join, leave

- insert, update, remove

- query, subscribe (sync, async),
  unsubscribe

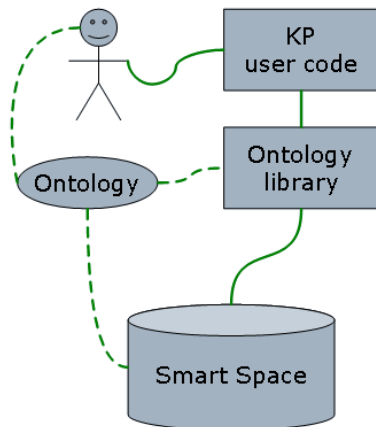Smart space access protocol (SSAP) for SIB↔KP communication

A kind of publish/subscribe system

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The Problem

- **Simplifying KP code using high-level OWL terms**
  - ▶ SIB uses low-level RDF triples
  - ▶ KP uses high-level abstractions

- **Target devices are low-performance**
  - ▶ Subset of ANSI C
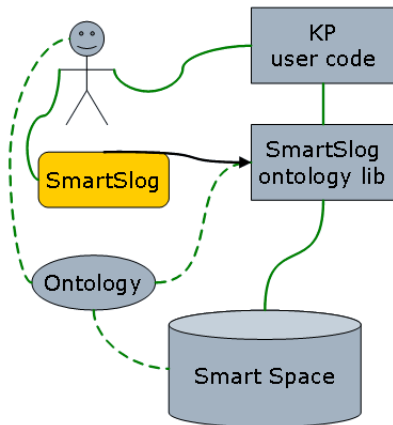 - ▶ Modest code schemes

These two criteria are controversial,
efficient tradeoff is a challenging problem

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SmartSlog

- ANSI C library generator
  for Smart Space ontology

- Mapping OWL to ANSI C code:
  - ontology library

- API for programming
  - Ontology abstractions
  - Modest code

Now KP programmer can think
in abstract ontology terms!

Writing KP code: User vision
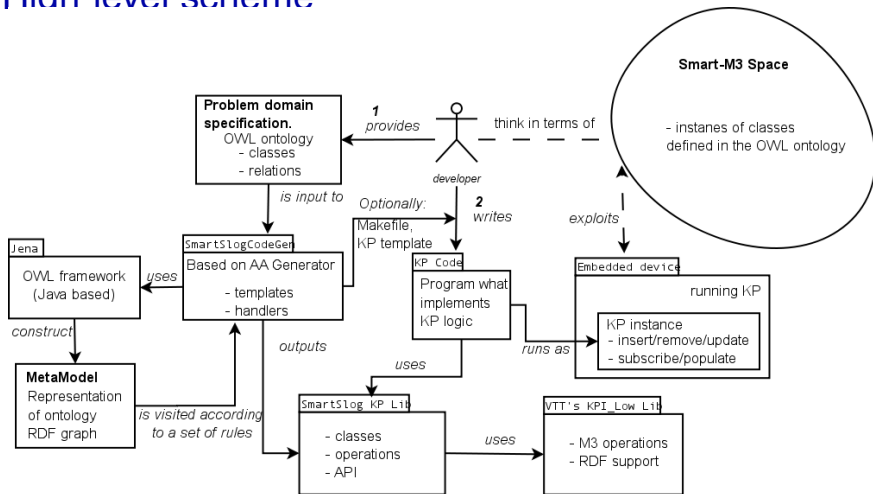
- **Domain specification** in OWL
  - SmartSlog inputs specification and outputs ontology library
  - API eliminates KP code from low-level triple-based details

- **Using the library**
  when writing KP code
  - KP logic is implemented in high-level ontological terms
  - Easy start coding from KP, template and Makefile generated optionally
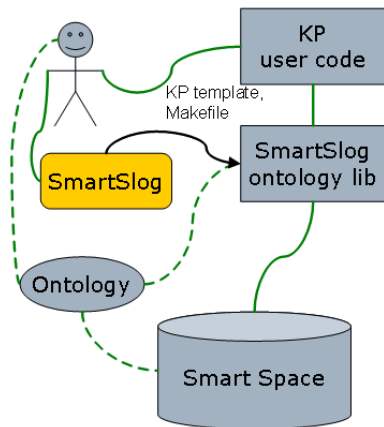
High-level scheme

Code Generation

- Java-based CodeGen

- Static templates/handlers scheme

- **Templates** are "pre-code" of data structures
  - ▶ implementation of ontology classes
  - ▶ implementation of properties for classes
  - ▶ tags ⟨name⟩ instead of proper ontology names
  - ▶ dependence on the mediator library (KP↔SIB)
    (SmartSLog uses KPI_low library)

- **Handlers** transform templates into final code
  - ▶ Replacing tags with the names taken from the ontology
  - ▶ Executed when the ontology graph is analyzed
   (CodeGen calls Jena framework)

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Last Architectural Changes

- SmartSlog CodeGen absorbs Abo Academi CodeGen
  - *previously, SmartSlog CodeGen called Abo Academi CodeGen*

- KPI_Low is an external library
  - *previously, KPI_low code had to be included to SmartSlog lib*

- Multilingual ontology libraries
  - ANSI C libraries (SmartSlog 0.3x and below)
  - In addition, C# library can be generated (SmartSlog 0.4x)
  - More handlers and templates for different languages
 - Language-specific API and their implementation

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Ontology manipulations

- Merging ontologies
  - Complete merging
  - Partial merging

- Creating different files
  with final code for ontologies
  - a file for each ontology
  - files with different
    parts of different ontologies

- Cardinality support

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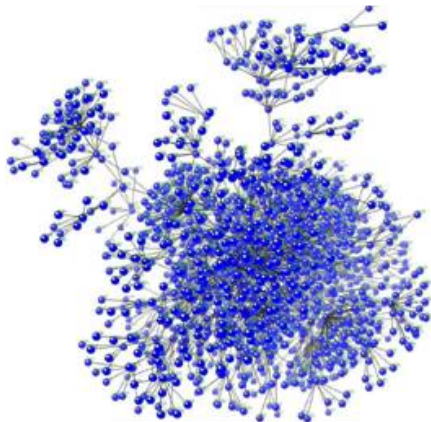
Optimizations: Implemented

- Memory control
    - \# ontology entities (C compiler preprocessor directives)
    - no local triple store

- Network traffic control
    - patterns for search
    - patterns for select

- Threading (POSIX)
    - asynchronous subscription

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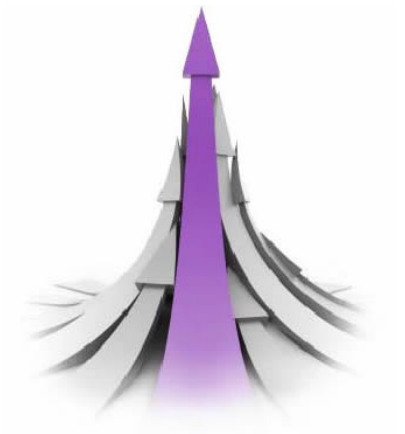
Optimizations: In progress

- API
    - data synchronization
    - data manipulations
    - OO-paradigm for API
      Object.set_property();

- Library
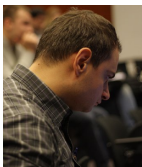   - caching
    - hash-table

- Pattern-based API
    - "closest" results
    - history and context saving

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The Team

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Links

- FRUCT R&D project:
  http://fruct.org/node/187/

- Developers wiki:
  http://oss.fruct.org/wiki/SmartSlog/

- Open source code:
  http://sourceforge.net/projects/smartslog/

- Bugzilla:
  http://oss.fruct.org/bugzilla/

Thank you

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