Using Semantics for Service Description

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Goals/Objectives of Semantics for Shared Services

- **Ontologies provide a common vocabulary and definition of rules for use by independently developed services**
- **Companies and organizations sharing common services can declaratively specify the *behaviors*, *policies* & *agreements* they use**
- **Service automation support for**
  - **Goal/vision: dynamic discovery & use of new services, previously unknown, to complete task**
  - **Reasoning / planning about services: on-the-fly composition**
  - **Comprehensive framework for lifecycle management**
  - **Integrated use with information resources: fully-automated customized, user experience**
- **Composition, mapping & vocabulary translation for independently developed resources & services – enables information sharing & process enactment consistently, accurately, & dynamically**

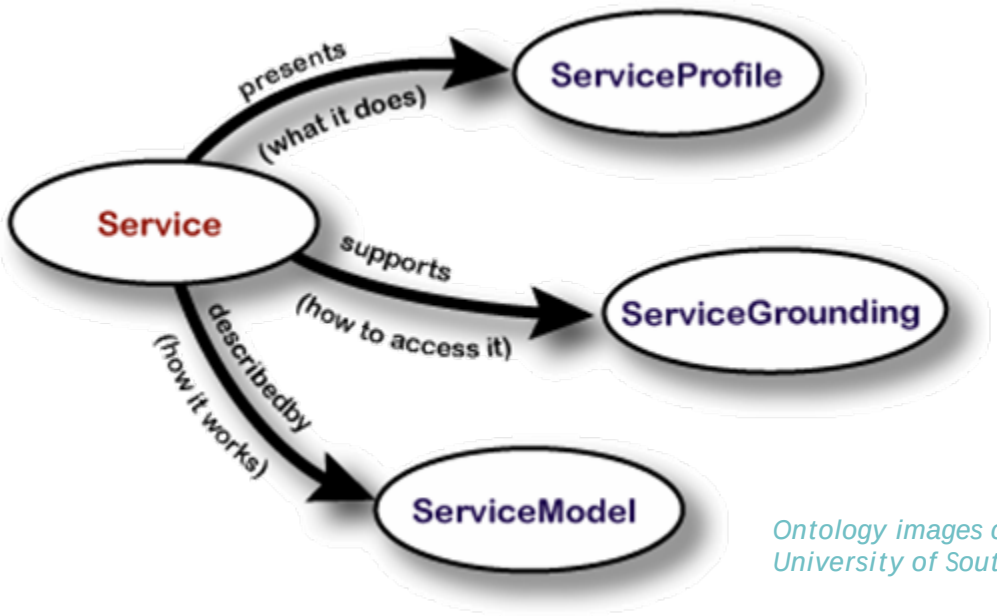
Active SWS Research Areas

- Language, vocabulary & reasoning approaches for
  - Preconditions & effects
  - Policies
  - Quality of Service
  - Commitments
- Discovery & selection (matchmaking)
- Composition, workflow / choreography adaptation
  - Interoperability analysis
- Resource & transaction management
  - Monitoring & recovery
- Service use with mobile / ubiquitous devices
  - Context
- Security
- Tools & Environments
  - (Semi-)automatic annotation

OWL-S: Enabling Infrastructure for Web Services

- **Based on research from the DARPA/DAML program (participants from SRI, Stanford, CMU, Nokia, NIST, BBN, Univ. of Maryland College Park, De Montfort Univ., Univ. of Southampton, USC-ISI, Univ. of Toronto, Yale …)**
- **OWL-S – an ontology that sits at the application level & describes *what* is being exchanged and *why*, not just the *how***
- **OWL-S enables**
  - *discovery* – **of services that meet particular requirements and adhere to specified constraints**
  - *invocation* – **and execution by agents or other services**
  - *interoperation* – **through specification of the appropriate vocabularies (semantics) and message parameter translation as required based on service specifications**
  - *composition* – **automated service composition and interoperation to provide new services**
  - *verification* – **of service properties**
  - *execution monitoring* – **tracking of execution of complex services and transactions**

Top-Level of the Service Ontology



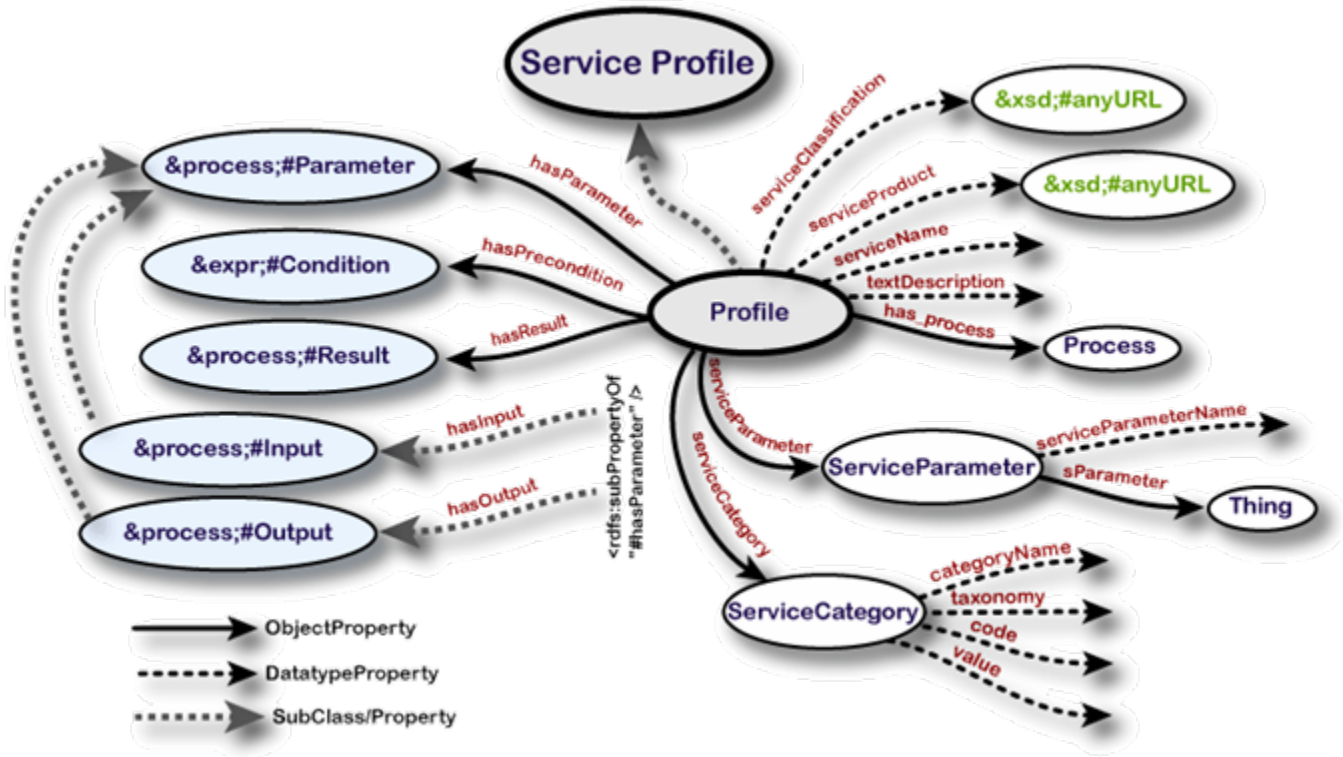
Ontology images compliments of Terry Payne, University of Southampton

Three essential types of knowledge about services

- **The *what*, its capabilities and parameters, through a *ServiceProfile*, which can answer questions such as what does the service require of agents and provide for them**
- **The *how*, through a *ServiceModel* that describes the workflow and possible execution paths**
- **Accessibility and usage through a *ServiceGrounding***

OWL-S Structure

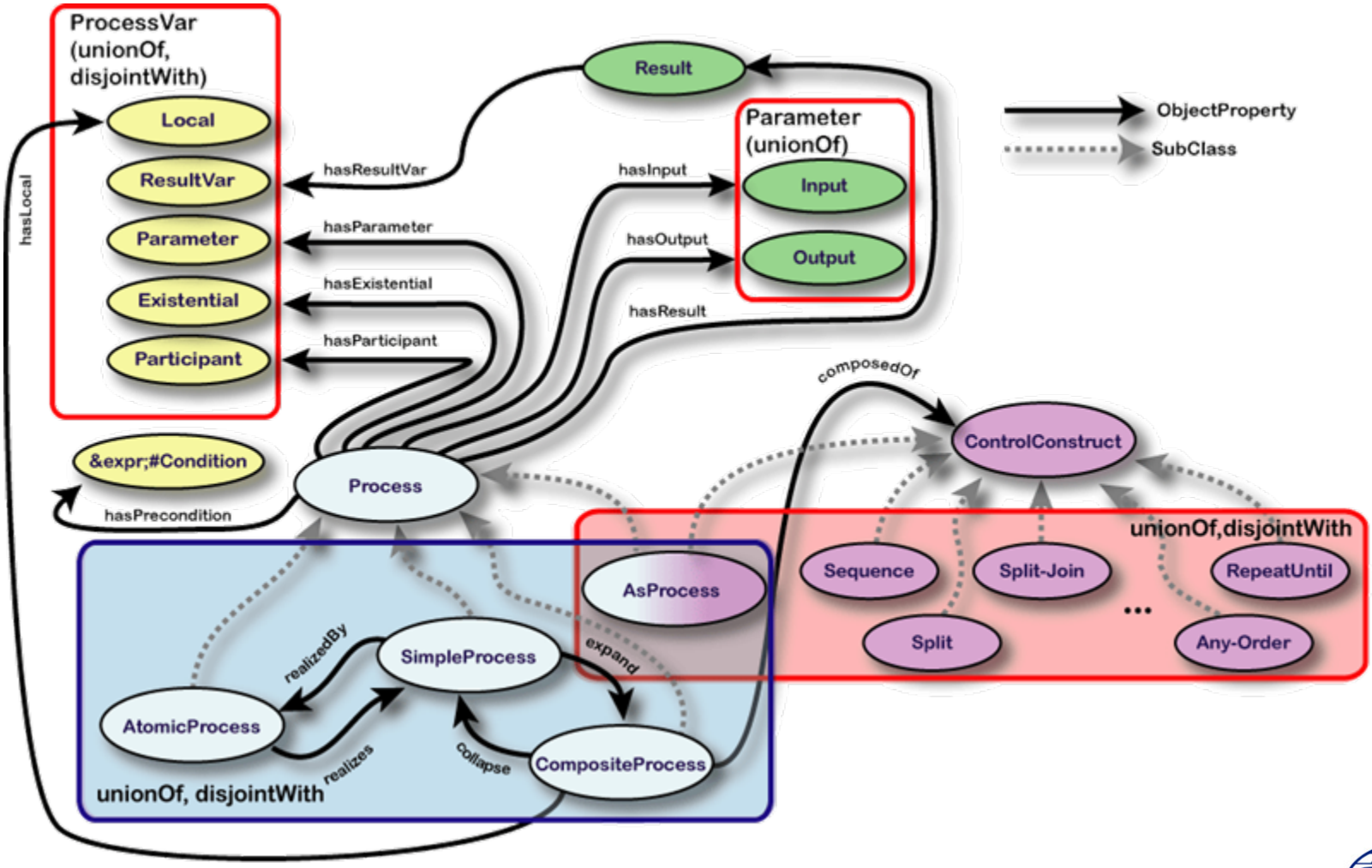
- Service profiles are used to request or advertise services with discovery services & capabilities registries, including
  - Descriptions of services and providers
  - Functional behavior & attributes



Process Model

- Process
  - Potentially interpretable description of service provider's behavior
  - Tells service user how and when to interact (read/write messages)
- Used for:
  - Service invocation, planning/composition, interoperation, monitoring
- All processes have
  - Inputs, outputs, preconditions and effects
- Atomic processes
- Composite processes
  - Control flow
  - Data flow
- OWL standard serializations; presentation syntax

Process Model (partial)



Current Discussion Thread

- A lot of work has been done on “Semantic Web Services”
  - OWL-S, WSMO, recent developments in EU …
- Maturity varies, but there is a common core
  - Includes classification & discovery
- SoaML should connect with that common core
  - Guidance from SAWSDL implementations
- Research has stalled to a degree, no definitive standard to date from W3C
- Ontology PSIG discussions with SoaML / SOA ABSIG members realize that the SoaML specification is sufficiently mature to take initiative at OMG

SoaML Meets Semantic Technologies

- **Initial steps:**
  - **create an ontology corresponding to the current SoaML specification (RDF Schema, OWL ontology), including hooks for BMM/BPMN**
  - **compare the results with leading vocabularies (SAWSDL, OWL-S, WSMO, IRS (European effort) …)**
  - **update the use cases developed originally for OWL-S & WSMO; extend them with more recent requirements, input from SoaML FTF/RTF participants, SOA Consortium members …**
  - **create an ontology of the relevant parts of the Business Motivation Model (BMM) specification with hooks for SoaML**
  - **create an ontology of relevant parts of BPMN with hooks for SoaML**

Roadmap

- Results of basic ontology specification would provide an additional exchange format for SoaML, potentially submitted through an RFC process
- Develop extensions to support gaps in service description
  - Based on additional features of OWL-S, WSMO, etc. identified in the comparison process & use case analysis
  - Capabilities needed to support linkage to BMM/BPMN
  - Other service description requirements from SOA ABSIG / SoaML community
- Prototype usage in SRI/CMU matchmaking, service composition tools
- Consider proposing extensions as add-ons to relevant specifications and/or as a new semantically-enabled service description specification …
- Make this actionable through jazz.net Open Services Lifecycle Collaboration - www.jazz.net/open-services