Web Services Semantic Web & P2P Together

... Improving the discovery of Web Services

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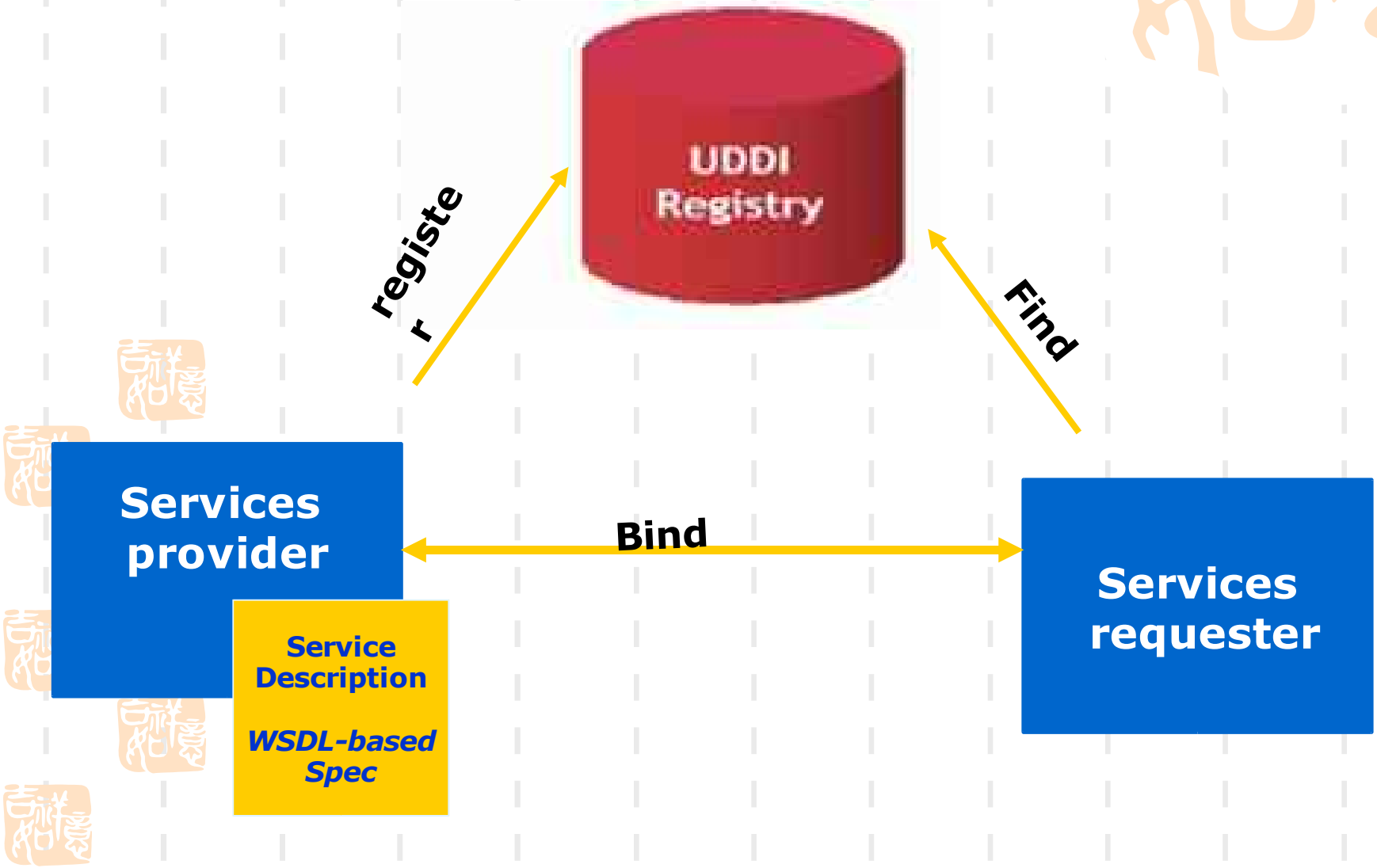
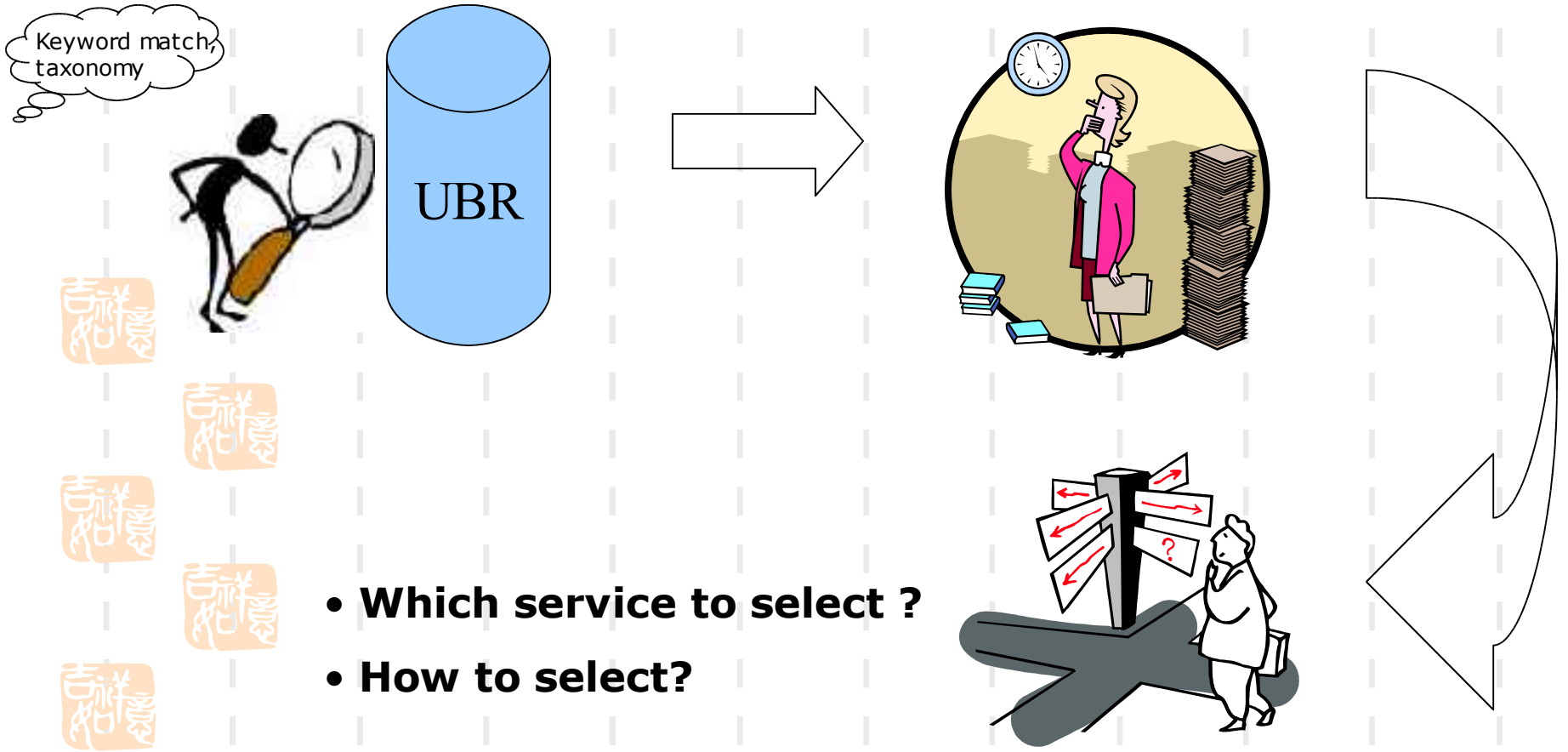
Current of Web Services Discovery



The problem in discovery…

Registry is universal and provides non-semantic search

Search retrieves lot of services (irrelevant results included)



- **Which service to select ?**
- **How to select?**

Limitations

- **Web Service descriptions are syntactic rather than semantic**
  - A limitation shared by all the XML based standards. They are lack of explicit semantics
  - Two identical XML descriptions may mean very different things depending on the context of their use
  - This proves to be a major limitation for capability matching: In fact, one crucial aspect of capability matching is that it can be done only at the semantic level
- **UDDI only allows a keyword search based on the names of businesses , services and TModels.**
  - Registry provides non-semantic search
  - Service matching in existing systems is syntactic (string matching)
- **UDDI Registry center is a kind of centralized architecture, the efficiency and scalablity are not well**

Solution

- Adding semantic to WS standards, WSDL & UDDI
  - Using DAML-S to extend WSDL
  - Importing semantic into UDDI
- Supporting domain specific ontology in each registry
- Using upper ontology to organize registries enabling semantic partitioning of all web services based on domains
- Using p2p-based decentralized infrastructure for better interoperability and mangagement of registries

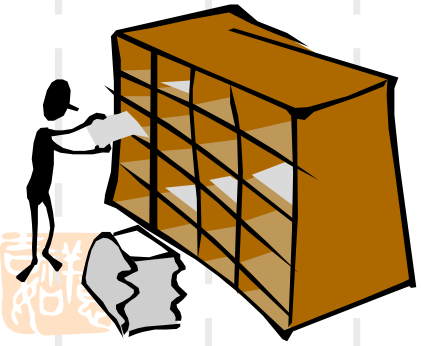
Result….

Descriptions are semantic-based

Registries are categorized

Select relevant registries

& semantic filtering



Ontology

Domain Registry

Select service(s) of interest

Registry is domain specific and supports semantic search

Involved Technologies

- Semantic & Semantic Web
- Ontolgy Technology
- DAML-S
- P2P infrastructure

Semantic web

The Semantic Web is an extension of the current Web in which information is given well-defined meaning, better enabling computers and people to work in cooperation. It is based on the idea of having data on the Web defined and linked such that it can be used for more effective discovery, automation, integration, and reuse across various applications."

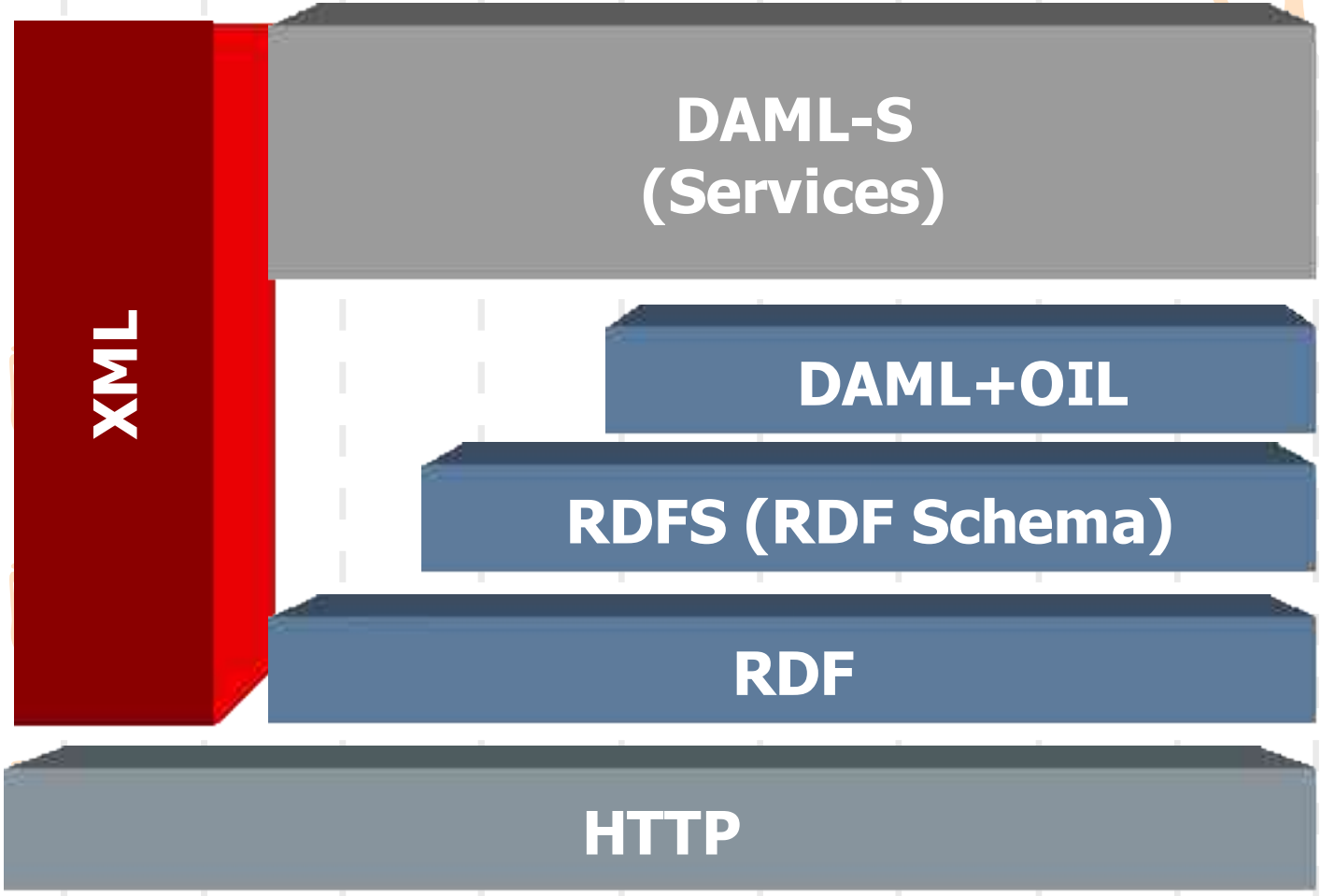
Source: ***Hendler, J., Berners-Lee, T., and Miller***

onology

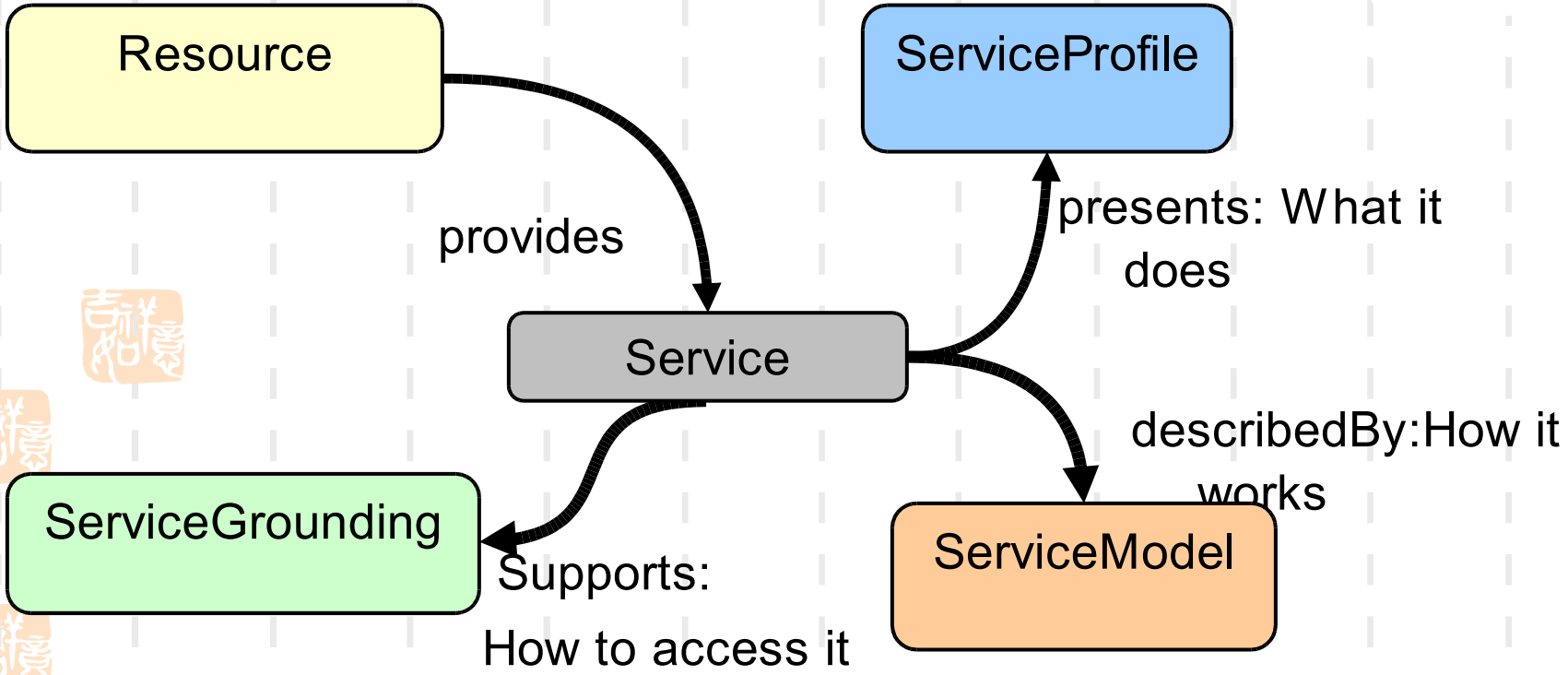
Main components of an ontology

- **Classes**: concepts of the domain tasks, usually organized in taxonomies and contain attributes
- **Relations**: express relationship between concepts in the domain
- **Functions**: Special case of relations in which the n-element of the relationship is unique for the n-1 preceeding elements
- **Axioms**: model sentences that are always true
- **Instances**: represent specific elements of the concepts, in contrast with general concepts or classes

Semantic Web languages



DAML-S



Source: www.daml.org/services/daml-s/0.9

DAML-S

Provides:

- Upper ontology for describing properties and capabilities of agents and services in a computer interpretable markup language
- Supporting ontologies for describing service types, security definitions, execution parameters, access and invocation characteristics
- Guidelines for advertising, modelling and requesting services
- Infrastructure to support the location and invocation of services

Desiderata:

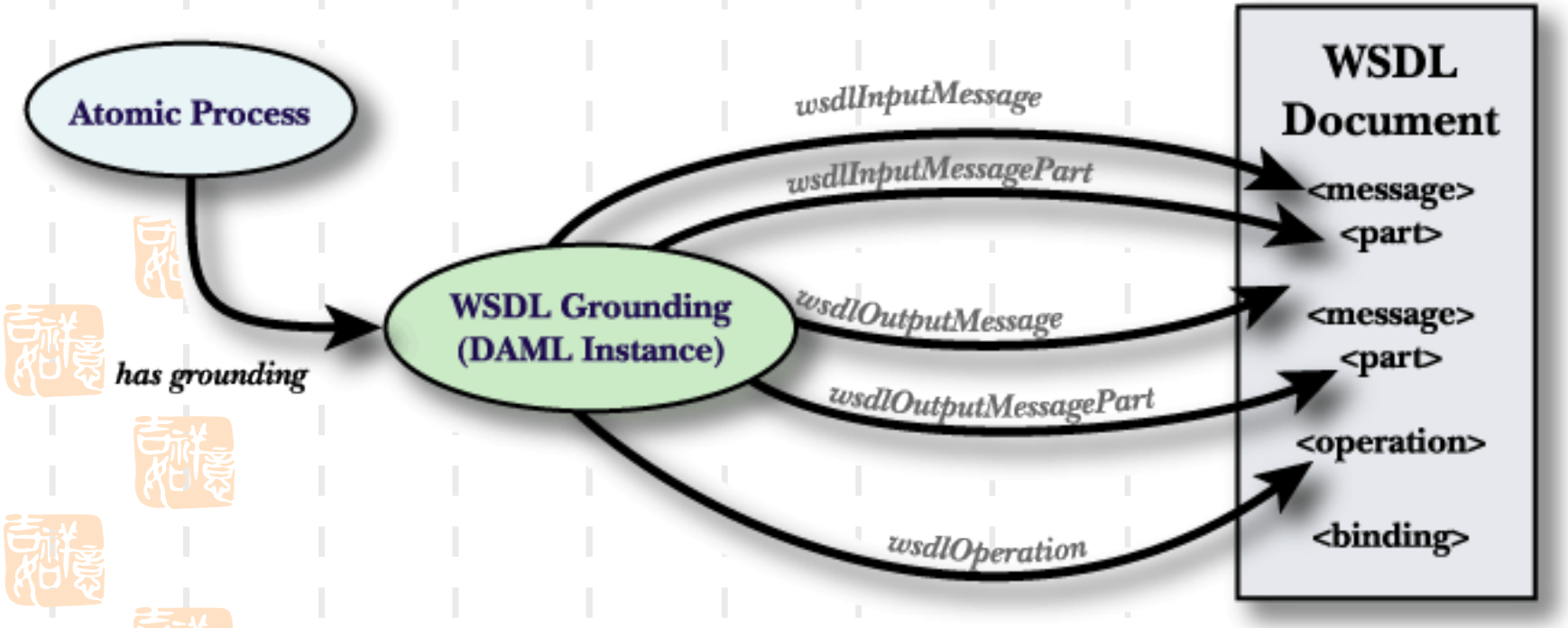
- Ontology of Web Services
- Ease of expressiveness
- Enables automation of service use by agents
- Enables reasoning about service properties and capabilities

Model Web Services using DAML/OWL syntax and DL

- Achieve semantic interoperability through tight coupling with Semantic Web standards
- Automate discovery, invocation, selection, composition, interoperation and monitoring

Source: T. Payne & K. Sycara

DAML-S / WSDL Mapping



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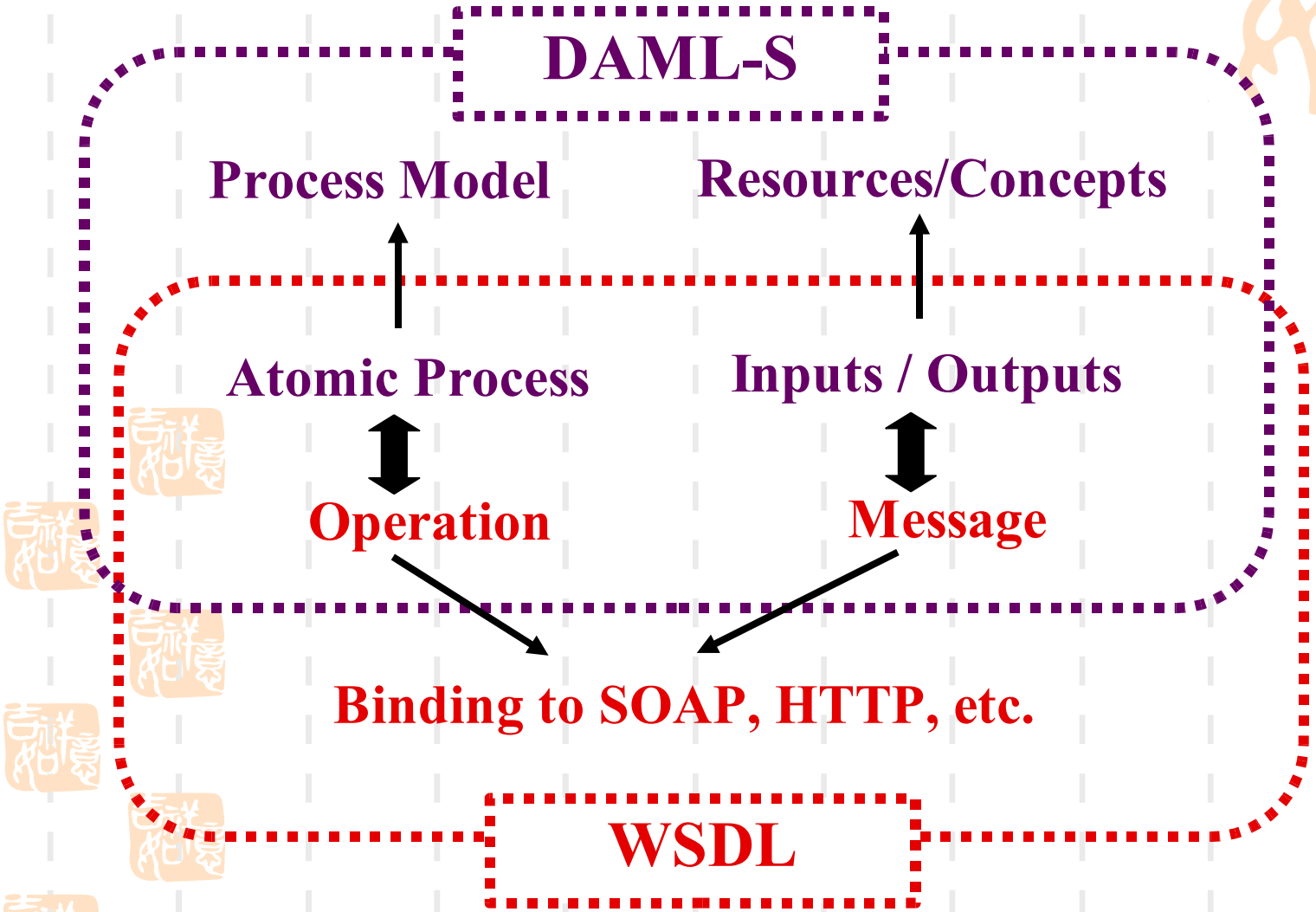
DAML-S / WSDL Binding



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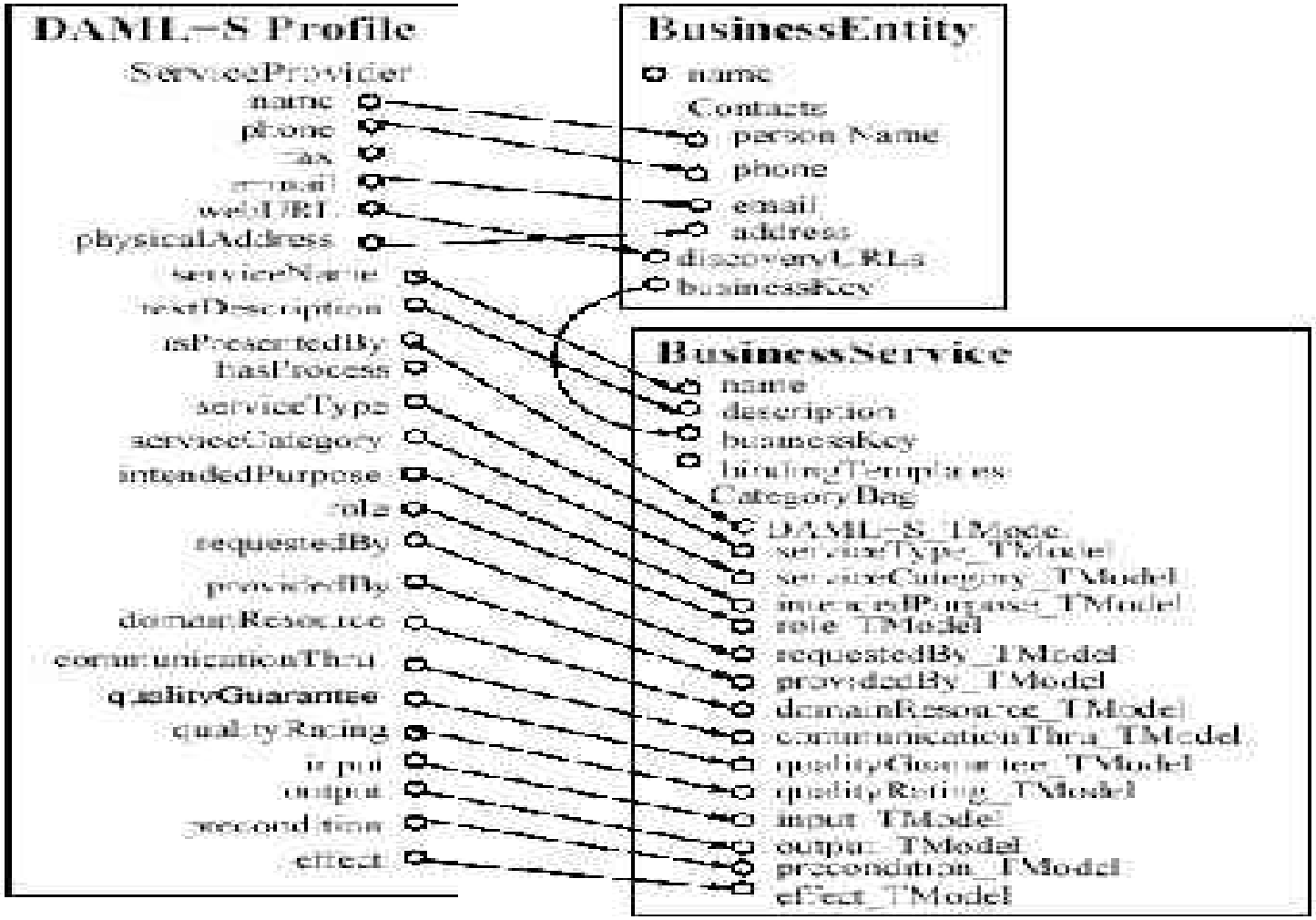
Importing Semantic into UDDI

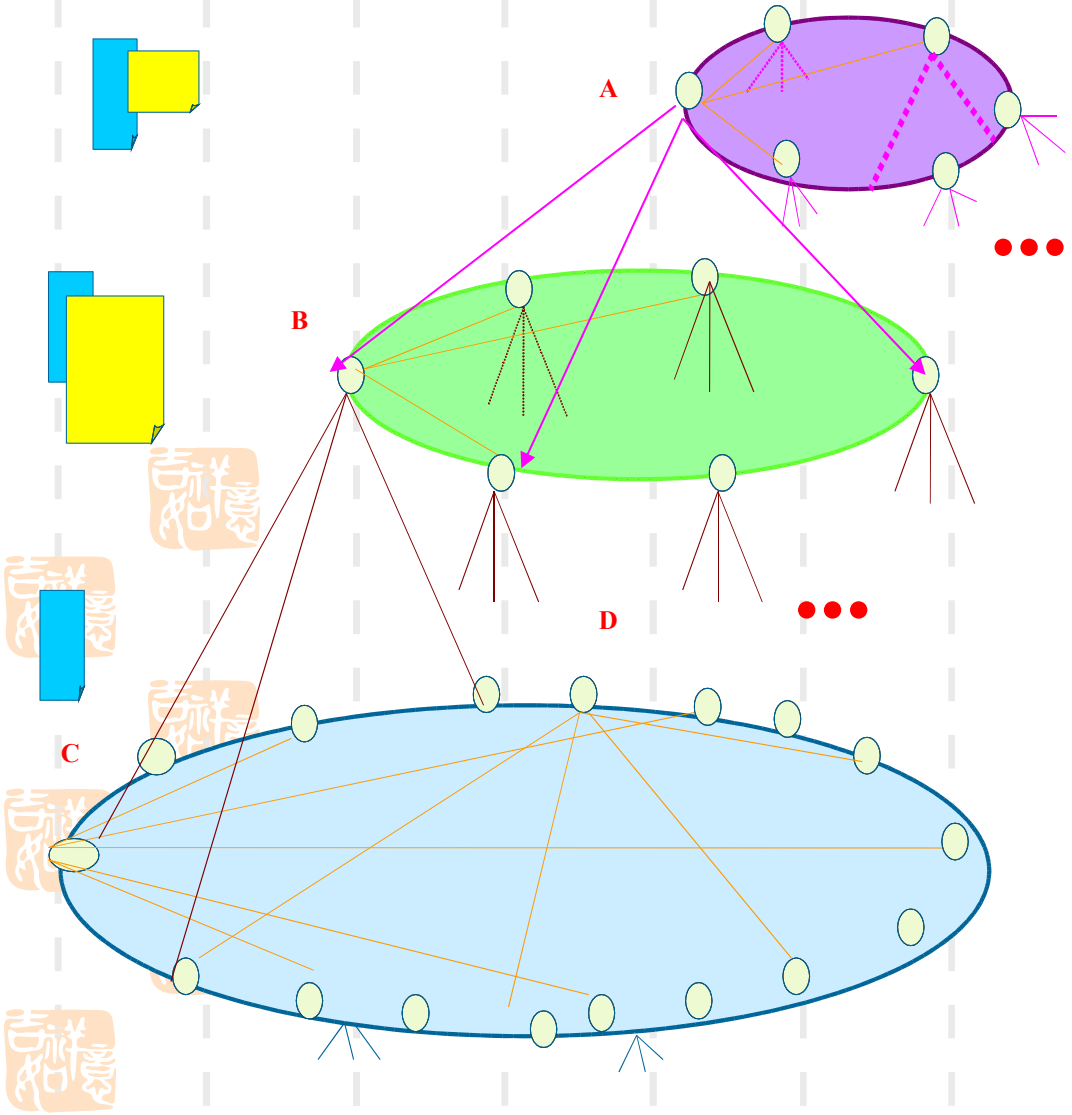


Source: M.Paolucci et al. 2002

Why P2P ?

- P2P could direct communicate between parties without intermediaries
- Decentralization of control
- Best suited for information sharing with a scalable approach
- Strong decoupling
  - Each endpoint is fully autonomous in its message exchange behavior and message content
- Strong mediation
  - Extensive support for bridging data and process differences resulting from strong decoupling (“compensating strong decoupling”)

Expanding UDDI registries by a hybrid p2p infrastructure

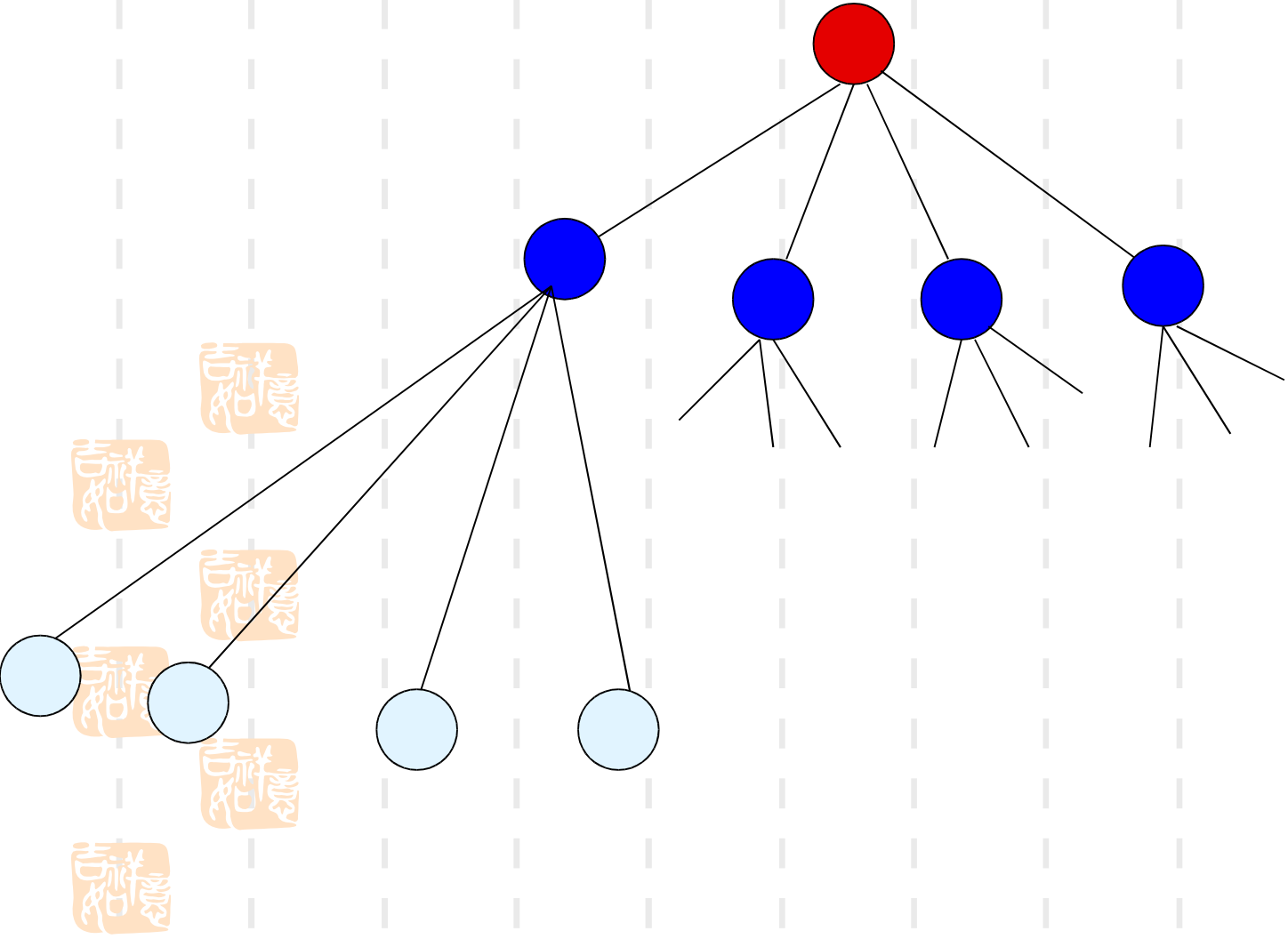


UDDI registries

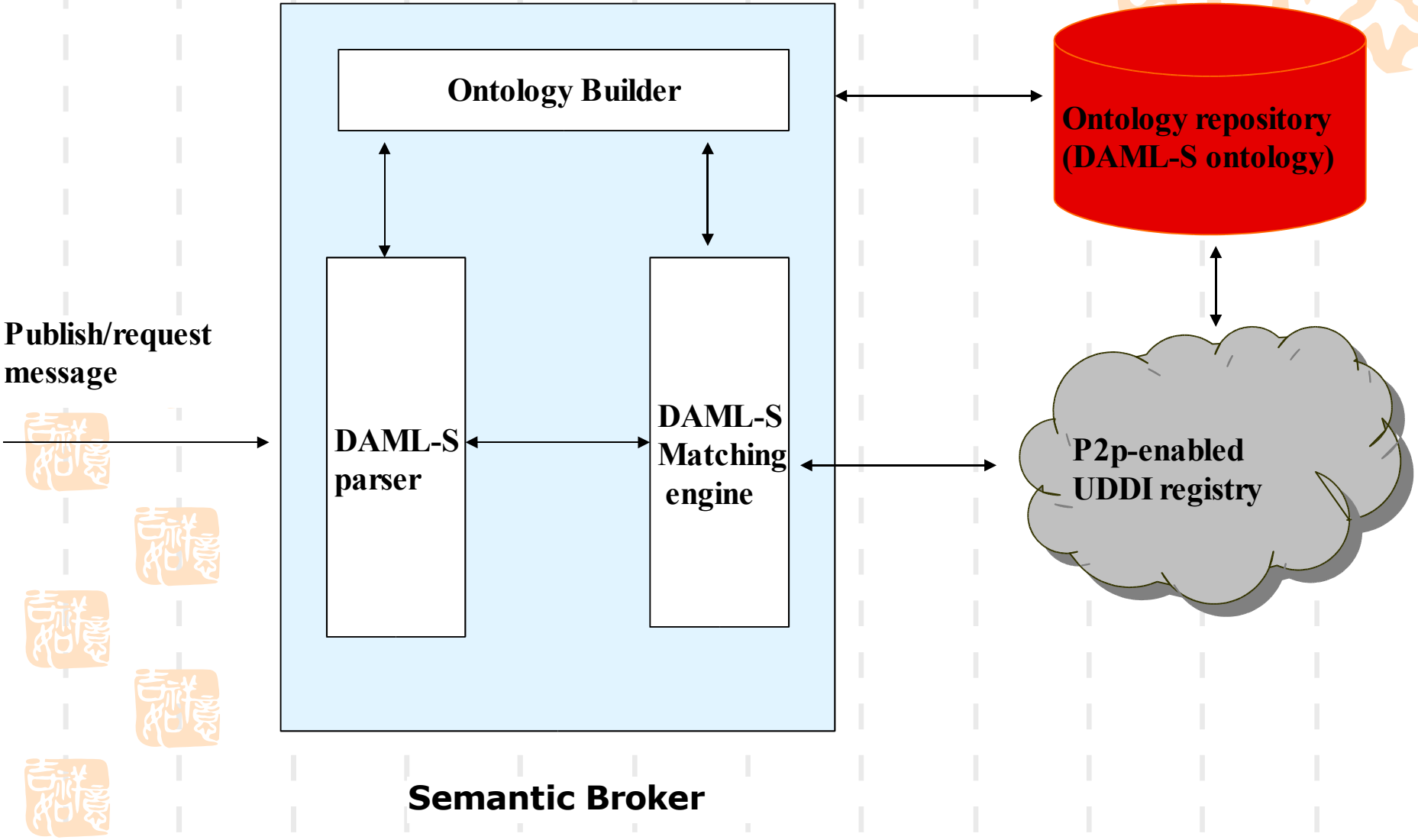
Service syndications

Specific peer-syndication
Ex. E-travel, finances, marketings…

Abstract view



How do them work ?



Discuss

- How to build ontology repository automatically
- Ontology tools
- Semantic reprentation of web service
- matching mechanism in UDDI registry
- Validate the efficiency of p2p-enable UDDI registry architecture
- What should the semantic web service interface look like?
- ...

Thanks