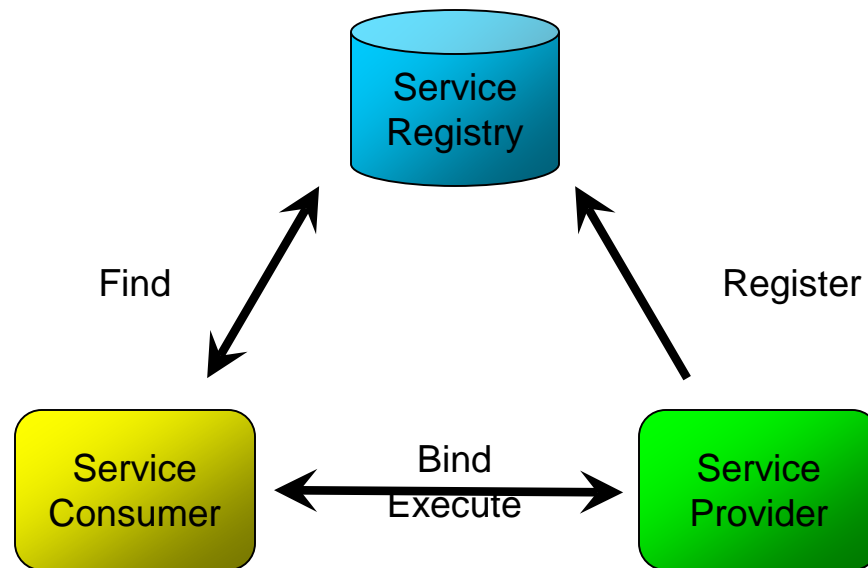# Linked Services Initiatives
Lightweight semantics for services on the Web of Data
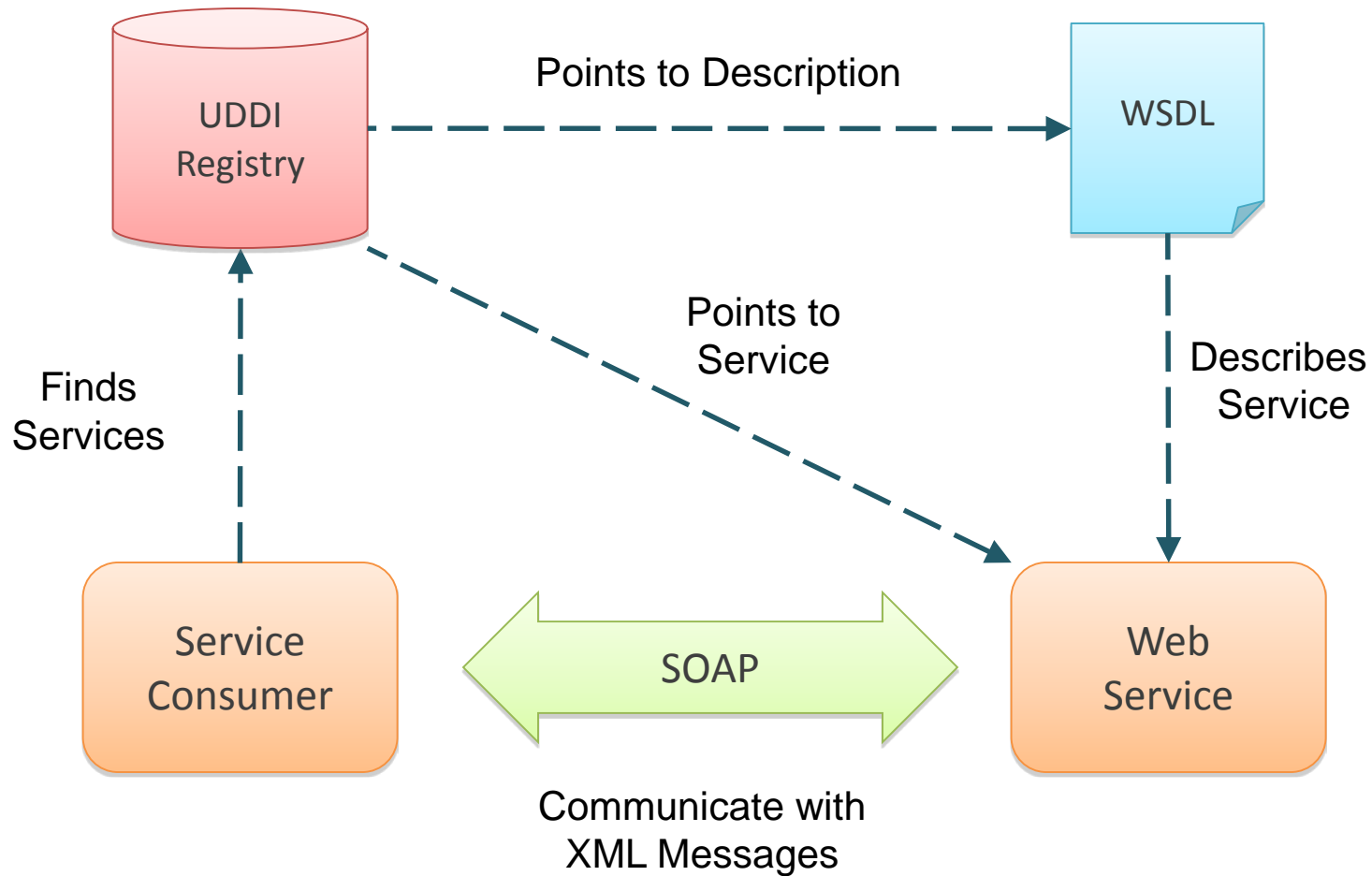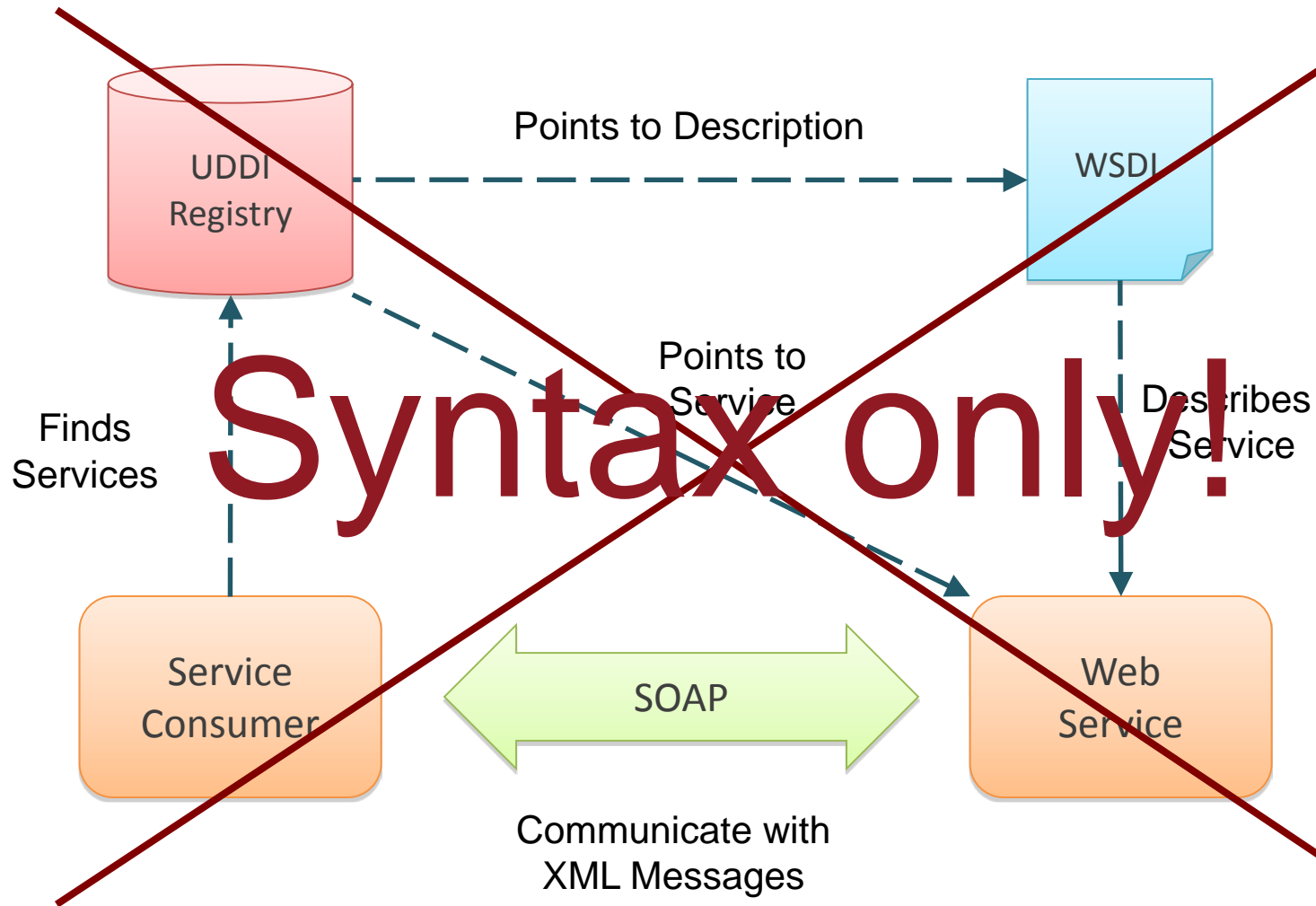
José M. García

STI, University of Innsbruck, Austria

- Semantic Web Services: the story so far

- Services on the Web of Data

- Current initiatives in Linked Services

- Conclusions

Classical Web Services

UDDI Registry

Points to Description

WSDL

Finds Services

Points to Service

Describes Service

Service Consumer

SOAP

Web Service

Communicate with XML Messages

- current technologies allow usage of Web Services
- but:
  - only syntactical information descriptions
  - syntactic support for discovery, composition and execution
  - **=> *Web Service usability, usage, and integration needs to be inspected manually***
  - no semantically marked up content / services
  - no support for the Semantic Web

=> Initial Web Service Technology Stack failed to realize the promise of Web Services

Problem: Lack of technologies to cope with the scale envisioned for WS
Solution: Techniques for automated support for service related tasks

- **Mechanized support** is needed for

  - Annotating/designing services and the data they use
  - Finding and comparing service providers
  - Negotiating and contracting services
  - Composing, enacting, and monitoring services
  - Dealing with numerous and heterogeneous data formats, protocols and processes, i.e. mediation

=> Conceptual Models, Formal Languages, Execution Environments
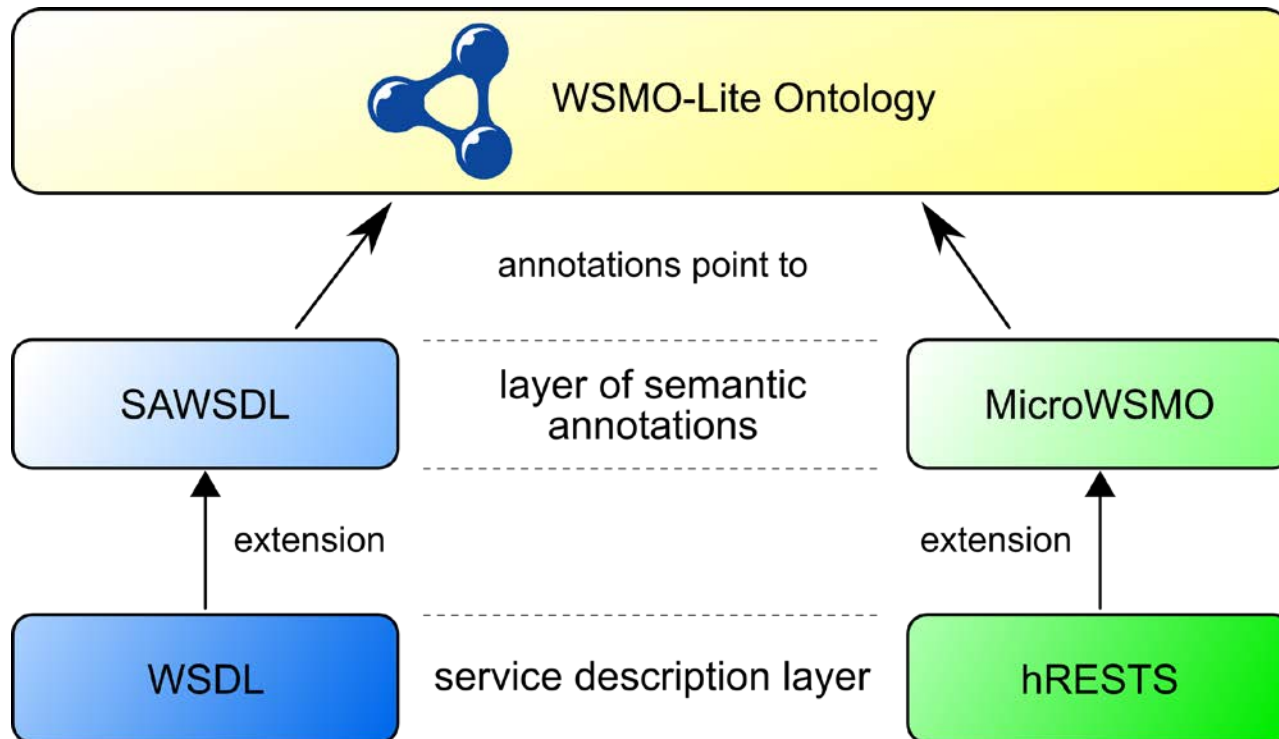
- WSMO

- OWL-S

- METEOR-S

- SWSF
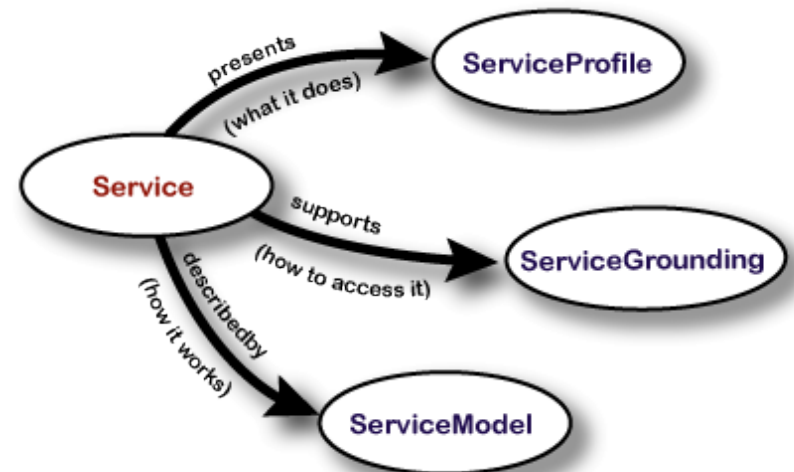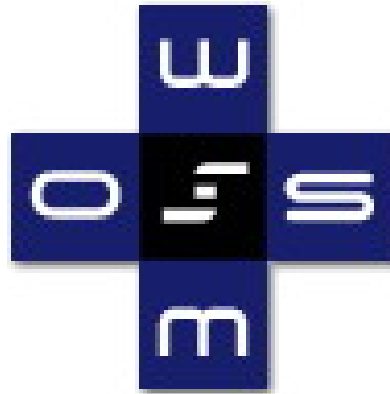
- ## The vision of Semantic Web Services (SWS)
  - Automating typical Web Service usage tasks.
  - Resolving heterogeneities issues.
  - Fostering scalability.
- ## Existing SWS approaches
  - WSMO, OWL-S, SWSF
  - Addressing the aforementioned problems.

  ### , but they are considered as
  - Heavyweight solutions.
  - Introducing new languages founded on a expressive formalisms.
  - Promoting the top-down modeling approach (semantics-first).
  - Grounded usually in WSDL-based services

A failed vision

- Semantic Web uptake
    - Heavyweight ontologies and reasoning did not get enough traction
    - Complex definitions
    - Computation needs

- WSDL-based services uptake
    - Mostly in intranets, for specific purposes
    - Not really WEB services

- Need for lightweight service ontologies.
- Directly built on top of the newest W3C standards
  - RDF(S), OWL, SAWSDL
- Promoting the bottom-up modeling approach
  - Augmentation of existing service specifications with semantic descriptions.
- Covering the other grounding approaches (i.e., REST)
  - WSDL-based services
    - 23757 services and 8094 providers according to Service Finder[1]
    - Many of them are used for the intra enterprise integration
  - RESTful-based services
    - 68% RESTful services vs. 19% SOAP services[2] ?!
    - Currently the dominant approach to offer services over the Web

[1] Statistics retrieved from the Service Finder demo on Dec 17th, 2009 @ http://demo.service-finder.eu/statistics
[2] Statistics retrieved from the Programmable Web on Dec 17th, 2009 @ http://www.programmableweb.com/apis

Bottom-up approach

WSMO-Lite

Figure from http://www.w3.org/Submission/2010/SUBM-WSMO-Lite-20100823/

Linked Data + Services = Linked Services
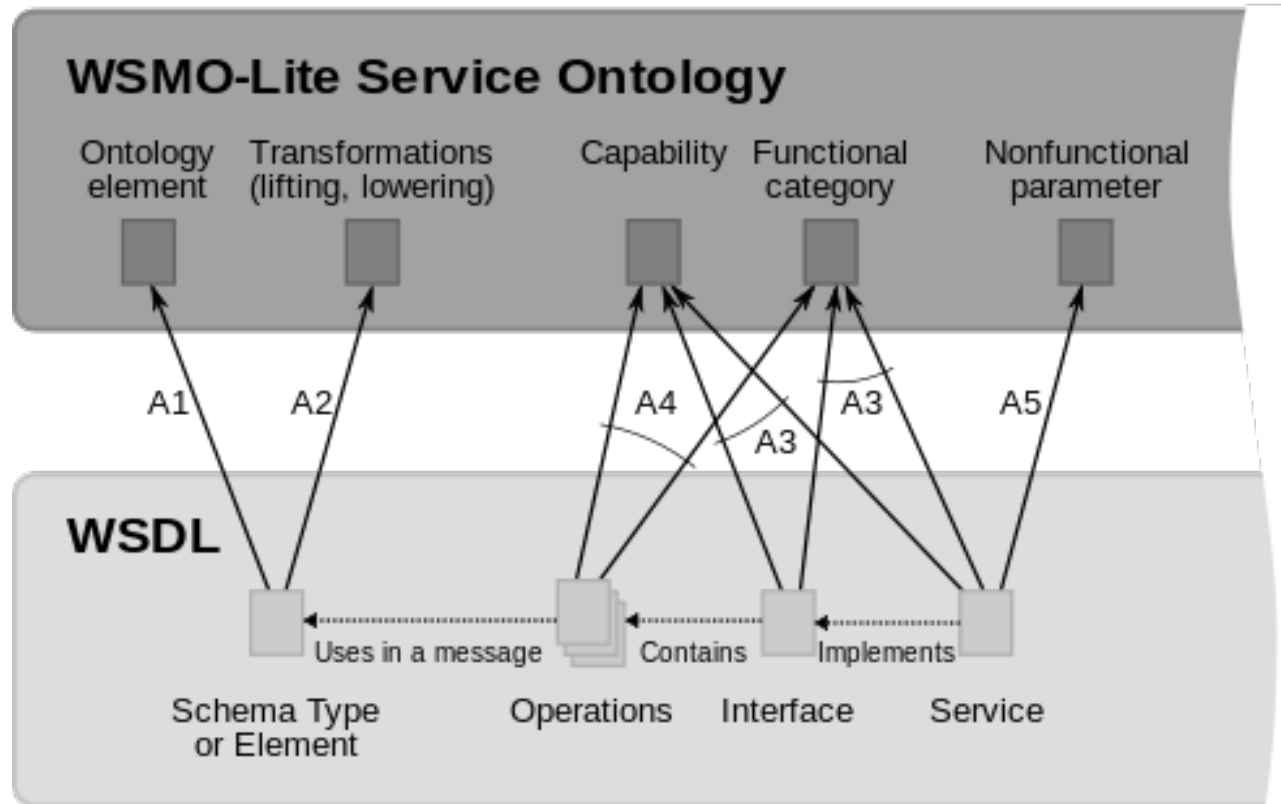
- Lightweight semantics

- Annotations made easy

- Interlinking related services

- Fostering real uptake

Figure from http://iserve.kmi.open.ac.uk/wiki/IServe_vocabulary/ (Carlos Pedrinaci et al.)

Are we going to fail again?

- Probably not this time…

- Linked Data is gaining momentum

- RESTful services are the real WEB services

- What about non-Web services?

- USDL
  - Universal Service Description Language
  - Developed mainly by SAP

- Linked-USDL
  - Aims at promoting the use of USDL on the Web
  - Remodelling USDL using Linked Data principles
  - Using existing vocabularies: GoodRelations, MSM, FOAF…
  - Several proposed vocabularies: core, price, sla…
  - Linked-USDL core vocabulary v1 released last January 2014

- Driven by
  - KMi (Open University)
  - SAP Research

- More at https://github.com/linked-usdl
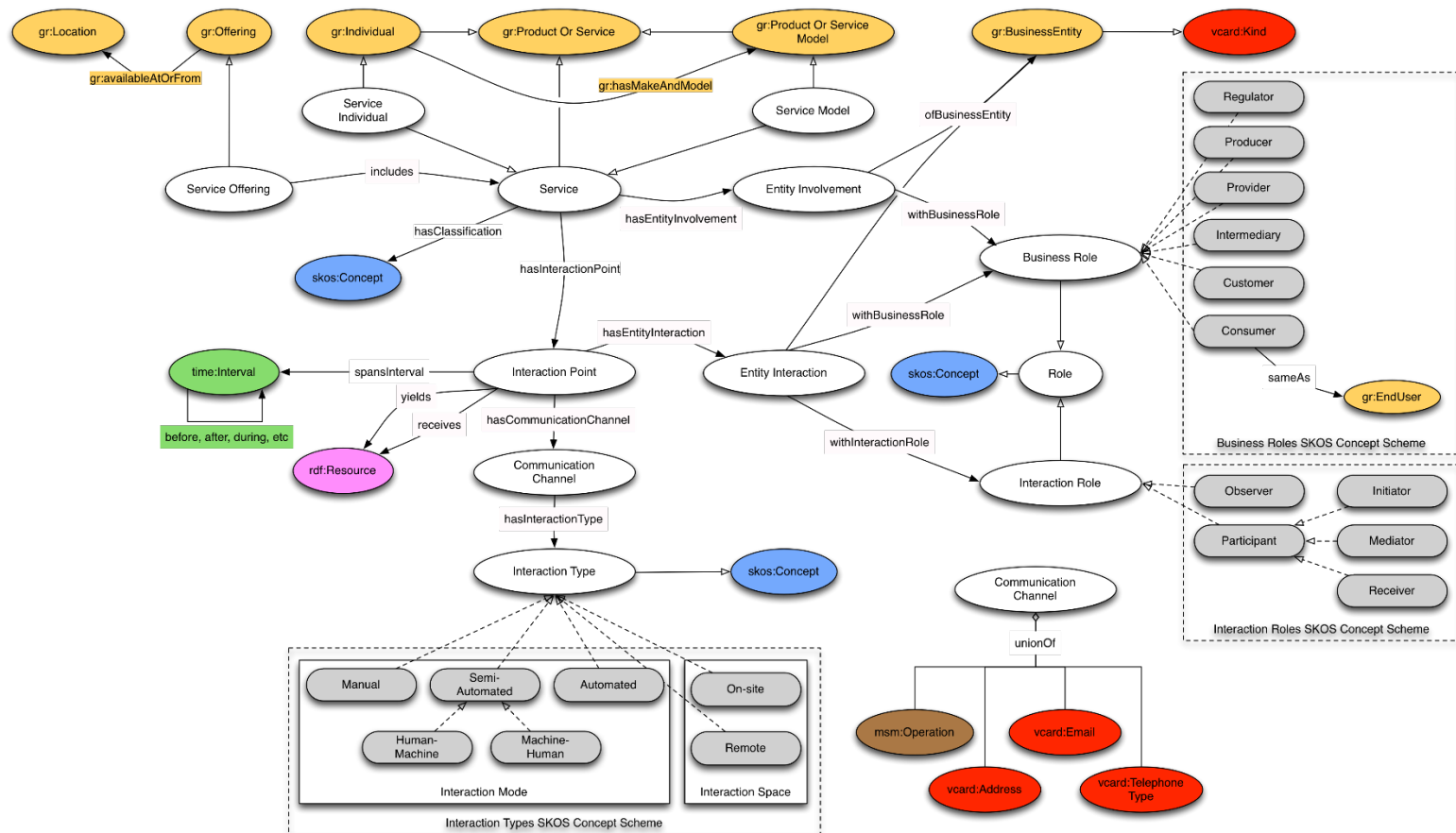
- Creation of extension vocabularies
  - Pricing
  - Agreements

- Linked-USDL Agreements
  - Collaboration between USE, OU, KIT, and STI
  - Connection with Linked-USDL core and other vocabularies
  - Tool support by transforming it to WS-Agreement
  - First draft model, examples available at https://github.com/linked-usdl/usdl-agreement

Conclusions

- (Semantic) Web Services are dead, long live Linked Services!

- Linked Data is gaining momentum

- Service descriptions should be kept simple and close to service definition

- Ongoing efforts (Linked-USDL)

Thanks for your attention

Questions?