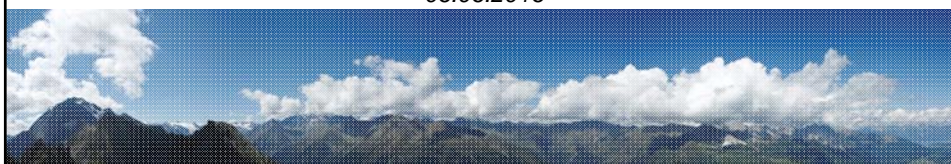


Semantic Web Services SS 2016

Linked Services

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Where are we?



#	Title
1	Introduction
2	Web Science + TourPack project (separate slideset)
3	Service Science
4	Web services
5	Web2.0 services
6	Semantic Web + ONLIM APIs (separate slideset)
7	Semantic Web Service Stack (WSMO, WSML, WSMX)
8	OWL-S and the others
9	Semantic Services as a Part of the Future Internet and Big Data Technology
10	Lightweight Annotations
11	Linked Services
12	Applications
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Outline



- Motivation
- Minimal Service Model (MSM)
- Linked Services
- USDL and LinkedUSDL
- Summary
- References



MOTIVATION

Motivation for Linked Services



- Availability of Linked Data enabled its practical application in service modeling
- “Data as a service” trend
- More advanced and flexible interlinking of services
- Step beyond WSMO, OWL-S, etc. solutions, towards simplification

...actively developed starting ca. 2010 till current days.

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MINIMAL SERVICE MODEL (MSM)

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MSM explanation



- MSM characterises Services as being composed of a number of Operations, which in turn have input, output and fault **MessageContent** descriptions. **MessageContent** may be composed of mandatory or optional **MessageParts**.
- The model is complemented by the WSMO-Lite vocabulary, which defines classes for describing the four core aspects of service semantics identified by previous research on service semantics, namely, *functional semantics*, *nonfunctional semantics*, *behavioural semantics*, and an *information model*. These types of service semantics are relevant for advanced discovery, selection and composition, among other tasks.
- The main classes of WSMO-Lite are **Condition**, **Effect**, and **FunctionalClassificationRoot**, used for capturing functional and behavioral semantics, and **NonfunctionalParameter** for nonfunctional semantics.
- To attach the semantics to the service model, we use the RDF mapping of SAWSDL, which defines three properties, namely **modelReference**, **liftingSchemaMapping** and **loweringSchemaMapping**.

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LINKED SERVICES

FOR THIS PART, FOLLOW PRESENTATION OF J. DOMINGUE & C. PEDRINACI: "LINKED SERVICES: CONNECTING SERVICES TO THE WEB OF DATA",

[HTTP://WWW.SLIDESHARE.NET/JOHNDOMINGUE/LINKED-SERVICES-CONNECTING-SERVICES-TO-THE-WEB-OF-DATA](http://www.slideshare.net/JOHNDOMINGUE/LINKED-SERVICES-CONNECTING-SERVICES-TO-THE-WEB-OF-DATA)

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STI · INNSBRUCK

USDL & LINKED USDL

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USDL and LinkedUSDL – What it is

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Welcome USDL-Core Business Roles Interaction Roles About

Welcome

Linked USDL aims to better promote and support the use of the [Unified Service Description Language \(USDL\)](#) on the Web. USDL is a platform-neutral language for describing services consolidated from [SAP Research](#) projects. The kinds of services targeted for coverage by USDL include human services (e.g., consultancy), business services (e.g. purchase order requisition), software services (e.g., WSDL and RESTful services), infrastructure services (e.g., CPU and storage services), etc.

Linked USDL is a remodelled version of USDL that builds upon the [Linked Data](#) principles and the Web of Data. This effort is therefore most concerned with remodelling the existing USDL

See also: <http://linked-usdl.org>

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General positioning of USDI and Linked USDL

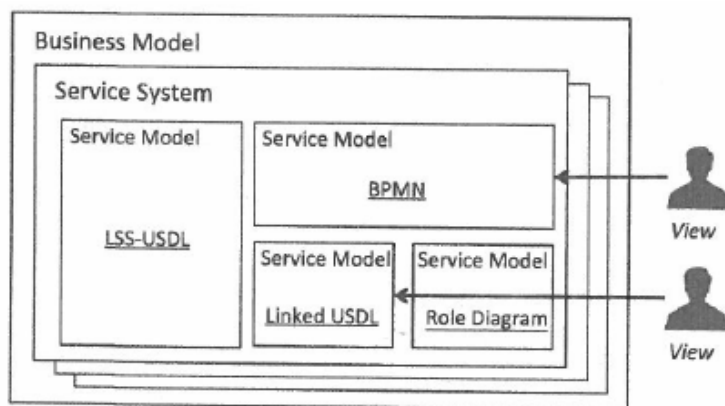
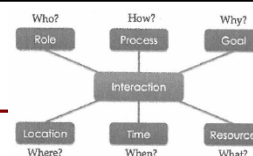


Fig. 1.3 Diagram explaining the relationships between business models, service systems, service models, service instances, and service descriptions

Source: Cardoso, J., Lopes, R., Poels, G. "Service Systems", Springer, 2014. ISBN 978-3-319-10813-1. 13

Linked Service System (LSS) Model Structure



The central element of the model is an **Interaction**. By matching the framework of common concepts discussed in the previous section with the interrogative pronouns, we obtain the concept **Stakeholders** for the pronoun "who", the concept **Goals** for the pronoun "why", the concept **Resource** for the pronoun "what", and the concept **Process** for the pronoun "how". The interrogative pronouns "when" and "where" are easily matched with the spatial and temporal context, respectively, of a service interaction. Furthermore, for a service system analysis, we can study the stakeholders' participation based on the actual roles that take part of an interaction. In addition, the flow of different resources can also be matched with the concepts **Input** and **Output**. Hence, we can describe service interactions with the six interrogative pronouns by using the following concepts:

- **Who:** **Role** (stakeholder; human or computer actor)
- **Why:** **Goal** (a service interaction goal)
- **What:** **Resource** (may be physical, knowledge or financial)
- **How:** **Process** (the business process a service interaction belongs to)
- **When:** **Time** (expresses temporal dependencies)
- **Where:** **Location** (the locations where service interactions occur)

Source: Cardoso, J., Lopes, R., Poels, G. "Service Systems", Springer, 2014. ISBN 978-3-319-10813-1. 14

LSS Implementation Example - Goals



```

1 :ReportIncident a lss-usdl:Goal ;
2   rdfs:label "Report Incident";
3   rdfs:comment"A user, technical staff or system reports an
   incident regarding an IT service.".
4
5 :HandleIncident a lss-usdl:Goal ;
6   rdfs:label"Handle Incident";
7   rdfs:comment"Execute several actions to deal with a reported
   incident.".
8
9 :RestoreNormalOperation a lss-usdl:Goal ;
10  rdfs:label"Restore Operation";
11  rdfs:comment"Restore the normal service operation as quickly as
   possible." .

```

Listing 4.6 Modeling the goals of interactions

Source: Cardoso, J., Lopes, R., Poels, G. "Service Systems". Springer, 2014. ISBN 978-3-319-10813-1. 15

LSS Implementation Example - Locations



```

1 :ServiceDeskOffice a lss-usdl:Location ;
2   rdfs:label "Service Desk Office".
3
4 :UserOffice a lss-usdl:Location ;
5   rdfs:label"User Office" .

```

Listing 4.7 Modeling locations within a service system

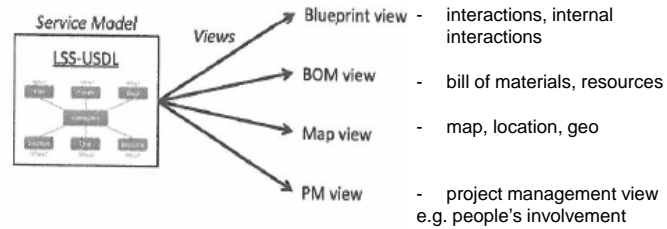
Source: Cardoso, J., Lopes, R., Poels, G. "Service Systems". Springer, 2014. ISBN 978-3-319-10813-1. 16

LSS – Service views



Commonly applied, also in tools e.g. graphical editors:

Fig. 5.2 Service views




Source: Cardoso, J., Lopes, R., Poels, G. "Service Systems". Springer, 2014. ISBN 978-3-319-10813-1. 17

USDL and LinkedUSDL - Overview




For introduction and overview to USDL and LinkedUSDL, follow presentation of J. Cardoso: "Linked-USDL",
<http://www.slideshare.net/JorgeCardoso4/107-linkedusdl>

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SUMMARY

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Conclusions

- MSM aims to simplify and minimise the service models developed by now, and provides a minimalistic ontology.
- Linked Services are connecting (linked) data with services; iServe is one of its main implementations.
- USDL is a language for modeling services from a business point perspective;
- LinkedUSDL is an instance of USDL employing linked data & having a semantic representation.

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REFERENCES

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- Pedrinaci, C., Kopecký, J., Maleshkova, M., Liu, D., Li, N., & Domingue, J. (2011). Unified lightweight semantic descriptions of web apis and web services.
- Cardoso, J., Lopes, R., Poels, G. "Service Systems", Springer, 2014. ISBN 978-3-319-10813-1.

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Questions?



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