

Modeling Service Dynamics: a Case Study

Nicola Guarino¹, Giancarlo Guizzardi^{1,2},
Mario Alessandro Bochicchio³, Antonella Longo³, Marco Zappatore³

¹ ISTC-CNR Laboratory for Applied Ontology (LOA), Trento, Italy

² Ontology and Conceptual Modeling Research Group (NEMO),
Federal University of Espírito Santo (UFES), Brazil

³ Set-Lab, Dept. of Engineering for Innovation, University of Salento, Lecce, Italy

1. Introduction

In previous work, Ferrario and Guarino have proposed an ontological analysis of the notion of service based on the notion of commitment (Ferrario & Guarino, Towards an Ontological Foundation for Services Science, 2008), (Ferrario & Guarino, Commitment-Based Modeling of Service Systems, 2012). In this approach, a service is understood as a complex process, consisting of several activities going on more or less in parallel, all dependent on a persisting *state* of generic commitment. More recently, in the framework of a cooperation project involving both LOA and NEMO, such approach has been revised and extended as a specialisation of the UFO ontology (Van Sinderen, et al., 2013). In this work, on one hand, the crucial notion of *commitment* is complemented by the dual notion of *claim*, capturing in this way the fundamental relational (contractual) nature of services; on the other hand, both commitments and claims are not understood as *states* of objects (namely, mental states of service providers or clients), but rather as *objects* in their own right, although specifically dependent, respectively, on providers or clients.

In this new view, at the core of the notion of service there is a *reified relationship* between a service provider and a (potential) *community of customers*, which is understood as a *bundle of commitments and claims*. Following (Guizzardi, 2005), these reified relationships are called *relators* in the UFO ontology. Note that this new approach does not reject commitment (or claim) states, but simply allows us to point at what these states are about, after all: specific mental attitudes of people or organizations. Most importantly, it allows for modeling the *dynamics* of service relationships, focusing on the subjects of change within such relationships: commitments and claims.

Modeling service dynamics is especially important from the point of view of service contract management (Bochicchio, Longo, & Mansueto, 2011). Indeed, especially for IT services, service contract conditions may be seen as a formalized description of commitments and claims, defined in the service model. They evolve in time during the whole service provision cycle, crucially depending on service level monitoring and management issues. As ITIL's Continual Service Improvement (CSI) (Case, 2007) states, service terms, or provider's obligations and penalties, can be defined after a monitoring phase when real values of SLAs' KPIs are available, and monitoring procedures have been agreed between service providers and service clients.

In this paper we shall discuss our new approach to service modeling in the context of a concrete IT service case, focusing on the dynamics of service lifecycle issues concerning an Italian company whose IT services come from the composition of lower level services, each one with its own contract specifications (Longo, Giacobelli, & Bochicchio, 2014). In this service composition case, the need for dynamic contract and service level management is even more dramatic, so that it is a good test for our approach.

2. Case Study

A service, even if conceived as a whole entity during its lifecycle, is subject to several changes according to its delivery context.

Let's consider the lifecycle dynamics of the email service at a business firm with more than 5000 employees spread out into more than 100 offices all over the nation.

The service manager at the IT department is in charge of developing and delivering the email service to the whole organization. In this case study the description of the email service will be furtherly specified and enriched with new details along the lifecycle steps.

Let's suppose the service manager must specify the email service offering according to what has been defined in (Van Sinderen, et al., 2013) in order to satisfy the requirements coming from his/her customer (or stakeholder) community. Meanwhile the service manager is in charge to design the service and look for providers able to deliver the (whole or part of the) services he has offered.

Let's suppose that the email service is provided via Web browser and email client, on Intranet, on Internet, and on mobile devices. The service manager has chosen to outsource the email service (mailbox management for sending, receiving, archiving, securing and anti-spamming, etc.) to provider A and the network management to provider B. Moreover email service for mobile devices (like Blackberry) is provided by a mobile network operator C. Figure 1 illustrates the network diagram for such email composed service.

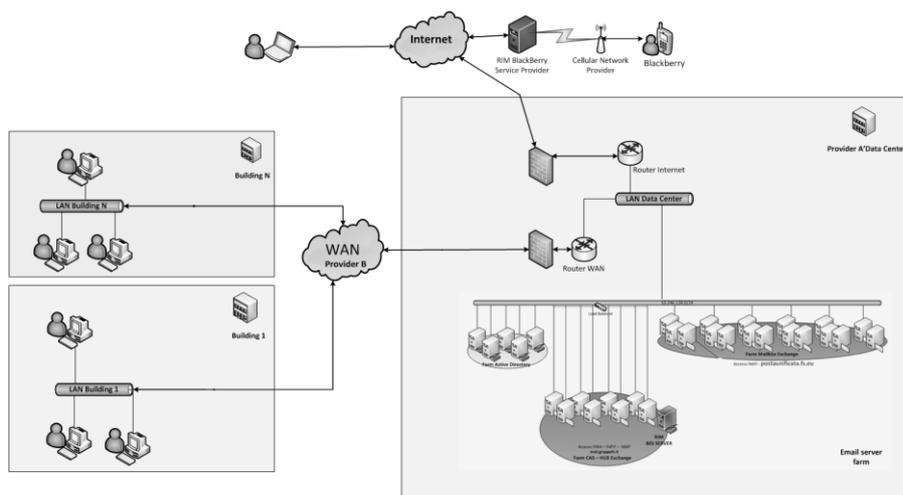


Figure 1. An example of email service and its IT service chains from final users to the data center delivering the service

Through the negotiation phase, the service manager defines commitments and claims with each provider, formalizing them into contracts' terms and conditions. Moreover the service manager must negotiate commitments and claims with his internal customer/stakeholder community and manage to relate them with the kind of obligations he/she has reached with each provider of the service components.

In service negotiation the service concept changes its shape because it becomes an actually delivered service and not anymore a promise of service.

Moreover in the contract a crucial part is related to the service delivery with specific focus on service monitoring and obligations in the case of low or absent quality of service. The service manager must clearly have in mind the different perspective of customers community and the service providers. For example let's suppose that at a certain time, from 8.00 pm to 8.30 pm of day x, a hundred users can't access the service via email client, but both mobile devices and Web clients work properly. This scenario raises several questions related to services contracts and obligations among the involved stakeholders.

First of all we envisage several stakeholders, who perceive the service and its dynamics very differently: the final user, who sends and receives emails, the contract manager who needs to know which provider is accountable of what service, the service level manager who is responsible to combine underpinning SLAs in a single SLA which is negotiated with final users or business, providers who are accountable to guarantee a service with SLAs as defined in contracts.

In the end-user perception, email service is available 24h 7x7 independently from the used channel (or IT service chain). So, in case of fault, user perceives that the service is not available (or it is at least degraded). Let's suppose for example that the network service provided by Provider B, gone down from 8.00 pm to 8.30 pm of day x, is guaranteed as available by contract in business hours (i.e. Mon-Fri, 8.00 am - 6.00 pm). In this case Provider B is not responsible for the fault, as it has happened outside the guaranteed availability's time window.

In this example Service Manager is accountable for the asymmetry between the service quality expected by his/her internal customers and the quality he has negotiated through service components contract.

The last part of service lifecycle concerns the dynamic of the service conclusion. In this case of email service, it can be terminated because a service component provider change; in this case commitments and claims about backups and data retrieval must be preventively agreed. Another scenario would consider the dismissal of email service as an internal service towards a full outsourcing and the related start-up of a new service negotiation with a provider.

References

- Bochicchio, M., Longo, A., & Mansueto, C. (2011). Cloud Services for SMEs: Contract Management's Requirements Specification. *2011 IFIP/IEEE International Symposium on Integrated Network Management (IM)*, (p. 145-152).
- Case, G. (2007). *ITIL v3. Continual Service Improvement*. Office of Government Center.
- Ferrario, R., & Guarino, N. (2008). Towards an Ontological Foundation for Services Science. In J. Domingue, & P. Traverso (A cura di), *First Future Internet Symposium* (p. 152-169). Vienna, Austria: Springer Lecture Notes in Computer Science, Vol. 5468, Springer.
- Ferrario, R., & Guarino, N. (2012). Commitment-Based Modeling of Service Systems. In M. Snene (A cura di), *International Conference on Exploring Services Science (IESS 2012)* (p. Vol. 103, 170-185). Berlin Heidelberg: Springer Verlag.
- Guizzardi, G. (2005). *Ontological Foundations for Structural Concept Models*.
- Longo, A., Giacobelli, S., & Bochicchio, M. (2014). Modeling Service Contracts Composition, Management and Visualization with Tree Graphs: Ma.Vi.C. *6th International Conference on Management of Emergent Digital EcoSystems (MEDES'14)* (p. 42-49). ACM, New York, USA.
- Van Sinderen, M., Almeida, J., Nardi, J., Falbo, R., Guizzardi, G., Pires, L., & Guarino, N. (2013). Towards a Commitment-based Reference Ontology for Services. *17th IEEE International EDOC Conference*.