Towards an Architecture for the Internet of Services

Aneta Kabzeva*, Markus Hillenbrand*, Paul Müller*, and Ralf Steinmetz†
*University of Kaiserslautern, Germany
†TU Darmstadt, Germany
*{kabzeva, hillenbr, pmueller}@informatik.uni-kl.de
†{ralf.steinmetz}@kom.tu-darmstadt.de

1. Motivation

Internet of Services (IoS) is an emerging research issue in the European ICT community. In the vision of the IoS [6] services are seen as tradable goods available via the Internet. They can be offered, searched, used, and composed into value-added services. The increasing adoption of service-oriented architectures (SOA) [3] allows the creation of service ecosystems of exposed and connected Web services [2]. The TEXO project [6] combines these two trends to create a platform that enables the offering and consumption of services via the Internet supported by an IT infrastructure supporting innovation [5], community facilitation, and automatic service integration in the consumer's environment.

2. TEXO Architecture

TEXO is a platform for service offering and consumption over the Internet supporting the whole lifecycle of a service – from innovation through offering, matchmaking, and usage, to feedback. In contrast to the typical service-oriented architecture roles (service provider, service broker and service consumer) [3] TEXO considers three additional roles: service innovator, community member, and platform host. During the interaction with the platform a stakeholder can take one of the five main roles in the different lifecycle stages - service provider, service consumer, service innovator, community member, and platform host. The TEXO Service Management Platform takes the role of the service broker.

From a software infrastructure view TEXO is based on a service-oriented architecture (SOA) [3]. All services are implemented as Web services [1]. A high-level architectural view that presents a low complexity overview on the platform is shown in Figure 1. In this view all architectural components are grouped in six blocks according to their role in TEXO. The interaction points available for the main roles are also included. The Service Management Platform (SMP) is the main part of the project and the one responsible for the execution of the TEXO functionalities offered to the different user. It comprises the TEXO Tools and Portal interfaces for the stakeholder, the TEXO Management Services (TMS), and the data storage components.

The TEXO Tools block includes all standalone applications offered by TEXO. A tool is dedicated to a single role. Currently TEXO offers supporting tools for service innovators (formal specification of innovation ideas, market prediction, and evaluation [5]) and service providers (service development tool supporting service modeling, design, and description [4]).

Browsing and searching tradable services and innovation ideas, SLA negotiation, auctioning of tradable services, and community portals are offered to the TEXO user as Web-based interfaces. These are referenced as TEXO Portal. TEXO interfaces are not role-specific. Every one of them has an explicit role management including authentication.

The functionality provided to the TEXO users via the TEXO Portal interfaces is implemented as real Web services contained in the TMS block. All functionalities needed for the management of tradable services – from the innovation process, through service creation, registration, discovery, and usage to the billing and feedback collection are realised by TMS.

The TEXO Registry & Repositories provide all data required from TMS and TEXO Tools and store the data they produce. The descriptions of all tradable services offered via the platform, monitoring data, community content, and innovation ideas are part of the stored data. Governance and ontology rules followed by platform processes and tradable services are also covered in this block.

To administrate the monitoring and billing actions

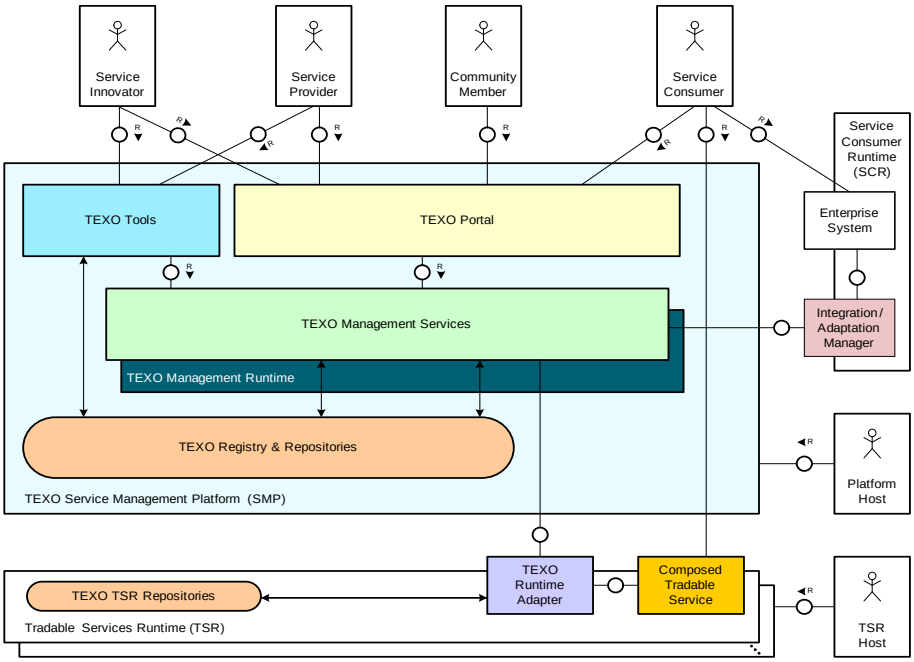

Figure 1. TEXO high-level architecture

on tradable services the TEXO Management Services on the SMP need an input from the tradable service runtime (TSR) of the specific service. The exchange of data between the SMP and the TSR is the TEXO Runtime Adapter. This adapter is offered by TEXO and is specific for the underlying runtime. Since not all tradable services offered at TEXO have to be also hosted by TEXO, the adapter is regarded as optional. For services running on a TSR without TEXO Runtime Adapter not all management options will be provided. E.g. no service quality would be granted by TEXO and the billing process has to be taken by the service provider. In such a case, TEXO would serve only as a service registry for the tradable services.

The automatic integration of tradable services in a service-based consumer application is one of the usage features of the TEXO platform. The integration is managed by an Integration/Adaptation Manager running on the consumer's environment (SCR). This manager is a piece of software implemented by TEXO for the concrete user environment. The integration specification details are provided from the respective TEXO Management Services.

3. Conclusion and Future Work

TEXO provides a SOA-based solution for the Internet of Services. The platform is currently under development. An evaluation of the chosen architecture is planned for the future and a collection of architectural guidelines which will be included in the governance framework developed within the project.

4. Acknowledgements

The project was funded by means of the German Federal Ministry of Economy and Technology under the promotional reference "01MQ07012". The authors take the responsibility for the contents.

References

[1] G. Alonso, F. Casati, H. Kuno, and V. Machiraju, *Web Services – Concepts, Architectures and Applications*, Springer Verlag, 2004.

[2] A. Barros, M. Dumas, and P. Bruza, "The move to web service ecosystems", *BP Trends*, 2005.

[3] T. Erl, *Service-Oriented Architecture (SOA): Concepts, Technology, and Design*, Prentice Hall, 2005.

[4] H. Kett, K. Voigt, G. Scheithauer, and J. Cardoso, "Service Engineering in Business Ecosystems", *In Proceedings of the 18th International RESER Conference*, 2008.

[5] S. Stathel, J. Finzen, C. Riedl, and N. May, "Service Innovation in Business Value Networks", *In Proceedings of the 18th International RESER Conference,* 2008.

[6] THESEUS TEXO, "Business Webs in the Internet of Services", http://theseus-programm.de/en-us/theseus-application-scenarios/texo/default.aspx., May 2009.