Chapter 8
Encapsulation of Complex HPC Services

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ABSTRACT

Developing and providing complex IT services typically enforces the cooperation of several experts from different domains. Beside the domain specific knowledge of every involved expert this typically enforces a profound knowledge of the underlying IT service infrastructures. In this chapter, the authors show how a complex (HPC) IT service product can be provided in an easy-to-use fashion via a service virtualisation infrastructure by referring to a complex medical simulation use case. In particular, they highlight how such a complex IT service can be integrated in a holistic virtual organisation environment and show how different experts from different domains can concentrate on their specific domain whilst being enabled to take advantage of the services provided by other experts / domains in a SOA like fashion.

INTRODUCTION

Meanwhile the Internet has become an integral part of our everyday life. Beside the opportunity to use the Internet as a source for information it has become common to use the "Web" also as interaction platform for the provisioning of services. Furthermore, with the trend towards cloud computing the Internet has become additional attraction towards a communication platform allowing for the provisioning of almost any kind of resource by using the relevant communication standards. Taking into account this kind of infrastructure allowing integrating a wide range of services and resources, which might also be distributed all over the world, the concept of Virtual Organisations (VO) has been coming up at the beginning of the 21th century. These VO

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models, like exemplary defined in (Dimitrakos et al., 2007), foresee to handle virtual resources, being typically made available via the Internet, to provide an aggregated, complex product consisting of different, orchestrated services. This approach has been considered in a large variety of research project, e.g. Akogrimo (Jähnert et al., 2010), BEinGRID, TrustCoM and BREIN (Taylor et al., 2009). In particular the enabling of such VOs towards a dynamic environment, allowing reacting by itself on unforeseen events, like e.g. the underperformance or the failure of a subcontracting service provider, has been considered within these research projects. However, the management of such dynamic environments, in particular taking into account the technical aspects that have to be considered e.g. when a service provider is replaced by another one, has been seen as one of the most challenging tasks. This is furthermore true for the internal management of resources within an organization. Enterprise Resource Planning (ERP) and Enterprise Application Integration (EAI) are getting more and more important for the efficient usage of the internally available resources, whilst facing similar challenges when operating a VO consisting of external services.

The conceptual solution for these issues has been faced with the upcoming of the Service Oriented Architecture (SOA) paradigm, which mapped the established and proven idea to provide standardised interfaces abstracting from the underlying realisation of the relevant functionality from electronic engineering to the software engineering world. To allow for this approach, web service technologies have been seen as the enabler for a real SOA in a distributed environment whilst being based on web technologies. However, this approach has only been successful in a limited way, since, due to a rank growth of a lot of relevant web service standards, the original goal, to decouple the interface definition from the related service implementation whilst enabling a service consumer by just invoking the relevant interface methods, has not been achieved. So far, only technically versed people are able to realise processes based on web services or consume the relevant services. In particular taking into account the differing IT experience of users shows that the current available environment are not satisfying the concrete needs of the relevant users.

Within this chapter we are going to present an infrastructure allowing for the best suitable support for such kind of virtual organisations allowing for the provision of complex IT service products. Therefore, we are going to describe the concrete requirements for such an infrastructure by taking into account that cooperation between organisations is usually driven by the intention to optimise the mutual benefits. Typically cooperation between business entities takes place because each involved entity can benefit from the collaboration. Additionally, typically with the provision of a service according to expert knowledge is sold as well, because the underlying processes realising the relevant service are usually the essential part distinguishing service providers, e.g. one service provider can provide a specific service cheaper, or with better Quality of Service (QoS) properties than another one. So this knowledge about the structure of a service or a process can be seen as the competitive advantage between them.

In order to keep this advantage in comparison with his competitors a service provider usually wants to hide this details about how a service is provided from his customers, and in particular from his competitors. The provision of such specialised services usually requires also a specialised environment and specialised knowledge. In particular in High Performance Computing (HPC) environments a detailed knowledge of the relevant systems is of essential importance, because otherwise there will be a significant decrease of performance, and thus increase of the corresponding costs. However, most users of such infrastructures are not aware of the technologies they are using, and thus potentially wasting time and money.