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## Chapter 11

# SCARCE: An Adaptive Hypermedia Environment Based on Virtual Documents and Semantic Web

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## Abstract

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*This chapter presents SCARCE, a flexible adaptive hypermedia environment based on virtual document and the semantic Web. After a short state of the art, the authors describe the design principles and the environment, which relies on three composition engines according to the three views of a document (semantic, logical, and layout). It also relies on the four stages of virtual documents: selection, organisation and filtering specified at a semantic level, and assembly. These specifications are parameters of the composition engine. Thus, this approach leads to a composition engine which has great flexibility. Consequently, it becomes easier to maintain and design an adaptive virtual document because it is possible to specify its main mechanisms. Such engine is obviously limited by core principles underlying the specification and which cannot be overcome.*

## Introduction

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Nowadays, numerous Web services are available on the Web. Adaptation/personalisation is one of their main issues. Adaptive Web services must have the ability to deal with different users' needs to enhance usability and comprehension and to deal with large repositories. At present, most adaptive hypermedia use local repositories and are not able to deal with external Internet resources. These adaptive hypermedia can provide different kinds of local content, different navigation tools, and different layouts according to user needs (Brusilovsky, 1996). Nowadays, the creation and/or maintenance of adaptive Web services must have the ability to deal with distributed repositories. Thus, the following features are required: (i) selection of the relevant Internet resources — information retrieval and filtering — and their organisation according to user needs; (ii) reuse, sharing, and exchange of resources through the Internet/intranet; and (iii) methods to facilitate Web service creation and management: how might we generate these services dynamically and automatically and how to maintain them.

Virtual documents focus on the reuse of resources and the dynamic generation of real documents.<sup>1</sup> A **composition engine** has the ability to compose real documents on user demand. This engine has to **select** resources, to **organise** and **assemble** them. When real documents are hypermedia, adaptation management can refer to adaptive hypermedia foundations. As soon as a real document is computed from distributed resources, an important issue is to ensure the real document consistency and then comprehension. In other words, it is necessary to have the right content at the right place in the right organisation. The composition engine needs to rely on a precise search engine through the Internet to get the right content.

It is well known that keyword-based information access presents severe limitations concerning precision and recall through the Internet. On the contrary, intelligent search engines, relying on the semantic Web initiative (Berners-lee, 1999), and semantic metadata associated with resources overcome these limitations. Moreover, the metadata schema enables designers to associate roles/functions with indexes to enhance information retrieval. The semantic Web has the ability to enable reuse, sharing, and exchange of resources through the Internet/intranet and to deal with automatic services. Nevertheless, Internet resources are so numerous that it is not sufficient to have a precise search engine. It is necessary to take into account user interests and to have an accurate metadata schema to be sure to focus on the relevant pieces of information. Adaptive virtual documents — such as hypermedia systems — can be viewed as automatic services dealing with different users' needs and distributed resources. Nevertheless, organisation and content have to be consistent according to user needs.

We have designed a flexible adaptive hypermedia environment based on virtual documents and the semantic Web, called SCARCE (SemantiC and Adaptive Retrieval and Composition Environment). In our environment, we are able to manage and to specify selection, filtering, and organisation at semantic level/declarative specifications. These three specifications are composition engine parameters and are called a generic document. Filtering is viewed as an adaptive navigation method (annotation, hiding) from which adaptive content can be derived. The filtering specification is defined by semantic properties associated with a generic document. These properties have the following

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