GALE: Generic Adaptation Language and Engine

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Abstract. On April 2, 2012 the Eindhoven University of Technology published the first adaptive PhD thesis [4] describing the research on the adaptation language and engine GALE, and served (adaptively) by the GALE engine. The aim of the this research was twofold: to make the authoring of adaptive documents feasible without much technical knowledge, and to create an adaptation and user modeling service that would allow a complete separation between content and adaptation. GALE thus consists of a Generic Adaptation Language that we briefly use in this demo, and of a Generic Adaptation Engine that is the focus of the demo.

Keywords: adaptation language, adaptation engine, user modeling, distribution, services

1 Introduction

Since Brusilovsky's original seminal paper about adaptive hypermedia [1] many new adaptation methods and techniques have been introduced, as summarized in [3]. When we started to develop the Generic Adaptation Language and Engine GALE[1] [5] we set out to create a flexible, extensible and highly configurable architecture in order to enable it to embrace new adaptation techniques as they appear.

GALE is a complete redesign of the AHA! system [2]. In AHA! it was possible to perform adaptation to resources (pages) that were stored on remote web servers. The adaptation however needed to be defined on the AHA! site that performed the adaptation. In GALE we take distributed adaptive applications to the next level: not only the resources but also the definition of the adaptation can be distributed. This is a major step because it means that one can set up an adaptation engine (performing user modeling and adaptation) "locally" (on a personal computer, a group or company server or even set one up as a public service) and that engine can use adaptation defined on a different site and apply it to resources that are possibly stored on yet another site. We call this *open model adaptation* (as opposed to the *open corpus adaptation* offered by AHA!).

[1] GALE was originally called the GRAPPLE Adaptive Learning Environment as it was developed within the EU FP7 TEL project GRAPPLE

2 Distribution in GALE

Figure 1 below shows how different "components" and people work together in realizing a single running GALE application.

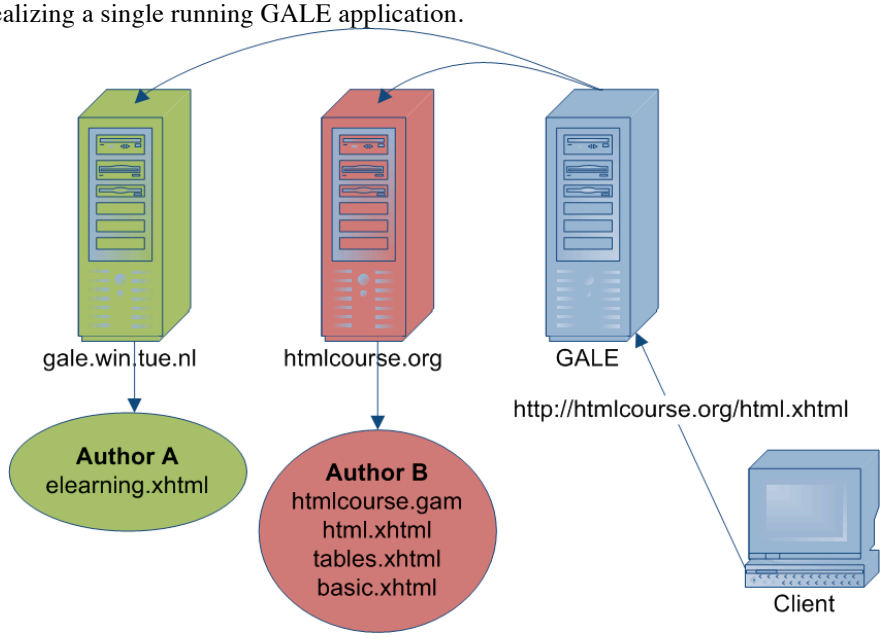

Fig. 1. The distributed nature of GALE.

Every GALE end-user accesses adaptive applications through a GALE server. This is the (blue) GALE server shown on the right. When an author wishes to create an adaptive course (s)he may wish to use some existing predefined adaptation rules. In the figure the (green) server on the left has a file elearning.xhtml written by Author A, containing such definitions. This file may for instance define the meaning of a *prerequisite* relationship between concepts, and may define how reading pages is translated into *knowledge updates* in a user model. The course author B, using the (red) server in the middle, creates a course by defining which concepts exist in the course and which resources (pages) are associated with the concepts. The concept definitions can be stored in a file with the extension ".gam" but can also embedded within the xhtml files using a <meta> tag. In the concepts B defines (in htmlcourse.gam) `->(extends)http://gale.win.tue.nl/elearning.xhtml` tells the GALE server to retrieve the adaptation rules from elearning.xhtml and apply them to these concepts. User model attributes and possibly also domain model properties can be interited using the "extends" relation between concepts. Note also that the course does not refer to the GALE server to be used by the end-users. Any server instance anywhere on the Web can serve author B's course, thereby performing author A's adaptation, and update the user models stored on that GALE server.

3 Performance of GALE

A traditional impeding factor for adaptive (hypermedia) systems has been their performance. Figure 2 shows how access times (and variation in access times) increase with increasing concurrent numbers of requests. They were measured on a 4 year old laptop computer, serving the adaptive thesis [4] or the GRAPPLE tutorial.

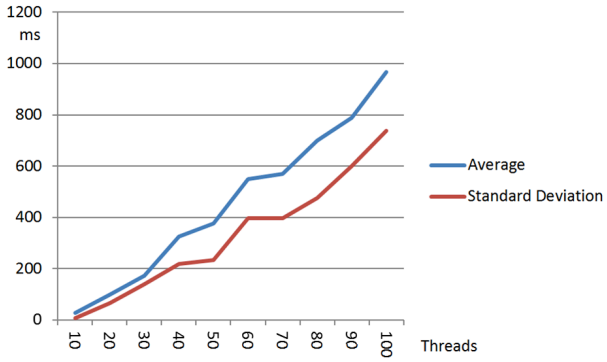

Fig. 2. Performance results for GALE.

Assuming that an end-user spends at least 10 seconds on average studying a web page the old laptop can serve up to 1.000 users with sub-second response times. So although GALE can be set up as a "personal" adaptation engine serving just one user it can just as well act as a server for a medium-sized company or a university.

During the demo we will use a "personal" adaptation engine to access the adaptive thesis from a remote site, with adaptation rules stored on another remote site.

References

1. Brusilovsky, P., Methods and techniques of adaptive hypermedia, in: User Modeling and User Adapted Interaction, vol. 6, pp. 87-129, Kluwer Academic Publishers, 1996.
2. De Bra, P., Smits, D., Stash, N.: The Design of AHA!, In: ACM Hypertext'06: Proceedings of the 17th ACM Conference on Hypertext and Hypermedia, pp. 133-134, 2006.
3. Knutov, E., De Bra, P., Pechenizkiy, M.: AH 12 Years Later: a Comprehensive Survey of Adaptive Hypermedia Methods and Techniques. In: New Review of Hypermedia and Multimedia, vol. 15, nr. 1, pp. 5-38, Taylor & Francis, 2009.
4. Smits, D., Towards a Generic Distributed Adaptive Hypermedia Environment. Adaptive PhD thesis, Eindhoven University of Technology, 2012. http://gale.win.tue.nl/thesis.
5. Smits, D., De Bra, P., GALE: A Highly Extensible Adaptive Hypermedia Engine, Proceedings of the 22nd ACM Conference on Hypertext and Hypermedia, pp. 63-72, 2011.

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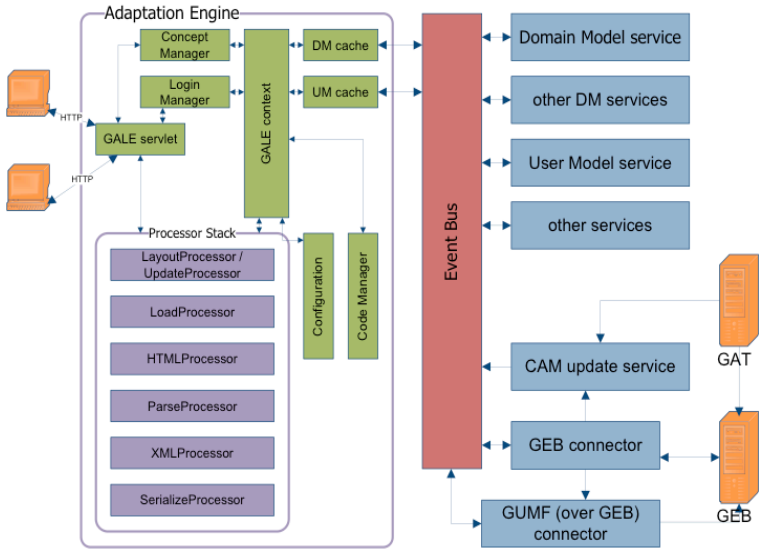
scalable, distributed architecture:

- adaptation engine
- domain model services
- user model services

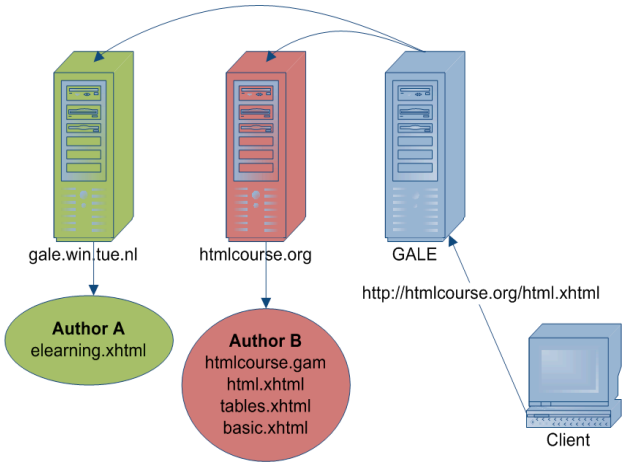


GALE can be:

- company server
- group server
- personal server

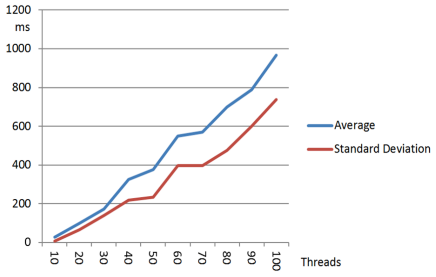
distributed authoring/services:

- adaptation definition
- adaptive application
- adaptation server



high performance:

- one small machine can serve approx. 1.000 users



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