Chapter II

Design Architecture:
An Introduction and Overview

Edward A. Fox
Virginia Tech, USA

Hussein Suleman
University of Cape Town, South Africa

Ramesh C. Gaur
Tata Institute of Fundamental Research, India

Devika P. Madalli
Indian Statistical Institute, India

Abstract

Digital libraries evolved in response to the need to manage the vast quantities of electronic information that we produce, collect, and consume. Architects of such systems have adopted a variety of design approaches, which are summarized and illustrated in this chapter. We also introduce the following three chapters, and provide suitable background. From a historical perspective, we note that early systems were designed independently to afford services to specific communities. Since then, systems that store and mediate access to information have become commonplace and are scattered all over the Internet. Consequently, information retrieval also has to contend with distributed/networked systems in a transparent and scalable
fashion. In this context, digital library architects have adopted various interoperability standards and practices to provide users with seamless access to highly distributed information sources. This chapter looks at current research and emerging best practices adopted in designing digital libraries, whether individual or distributed.

Introduction

Every digital library (DL) is constructed according to some design and architecture. These DLs are built upon suitable technology, and must support operations, as well as function as integrated systems, to support a target user community. While there are generic needs common for most DLs, such as searching and browsing, specific communities often require specialized services and prefer particular types of user interfaces and display formats. In accordance with one of S.R. Ranganathan’s Five Laws of Library Science, that is, “Every Reader His/Her Book,” DLs should be designed so that user information needs are met. Individual systems must address conformance to standards, digital preservation, indexing styles, logging, security, and tuning. In the case of distributed DLs, there also are requirements for data federation, interoperability, scalability, service federation, and Web services.

This chapter presents an overview of DL design architecture. While this chapter provides an introduction and overview, the remaining chapters focus on particular issues in design and architecture, presenting focused results from the research and development arena.

Chapter III describes the Indonesian Digital Library Network (IndonesiaDLN), a nation-wide DL initiative, from inception to its current status. The basic objective of IndonesiaDLN is to collect, manage, share, and reuse the nation’s intellectual capital towards the development of a knowledge-based society. Early work was guided in part by the evolution of the Networked Digital Library of Theses and Dissertations (NDLTD). The overall initiative is explained using the 5S (Societies, Scenarios, Spaces, Structures, Streams) Framework and the Ganesha Digital Library (GDL) open source software is introduced.

Chapter IV describes dynamic metadata management for digital archives. It discusses the development, features, structure, functions, and use of Metalogy - an XML metadata framework system developed in the context of the Digital Museum Project in Taiwan. Beginning with the basic design concept of a metadata system with the requirement of supporting various metadata formats, a solution based on multi-XML schema is presented in terms of information organization, schema construction, and metadata management.