

Performance Modeling: E-Bookstore

Date Assigned: 23 January 2015

Date Due: 2 Feb 2015 at 12:30PM

Objective: The goal of this project is to demonstrate your ability to model the performance of an e-business website using the Use Case, Sequence Diagram, and Software Execution Model techniques we studied in class.

Background:

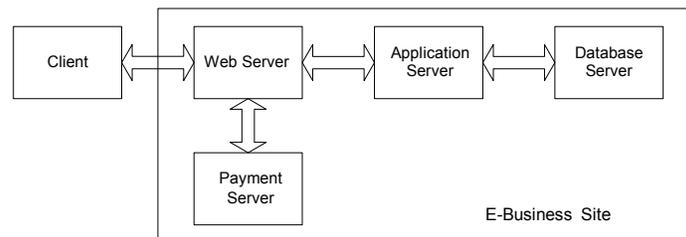


Figure 1: Servers for an E-Business website

Figure 1 illustrates some of the common software servers that are used to support e-business functions. An e-business function is performed by several servers in an e-business website. Requests from browsers are clients of the services provided by the servers on the e-business website.

Figure 1 illustrates a typical architecture of an e-business website. The frontend server is a Web server. This server supports the HTTP protocol. It serves the homepage of the website, retrieves static HTML pages and launches programs (e.g., CGI scripts, servlets) that generate dynamic contents. These programs are functionalities implemented by the application server. Examples of these functionalities include searching for items in a catalog by keywords. In many cases, the application may need data stored in persistent storage (e.g., disk). Database management systems are used to provide efficient access to data in persistent storage. Thus, the application server may need to interact with the database server to obtain the data it needs to execute the requested operation. The response of a functionality is typically formatted as an HTML page that is returned by the Web server to the requesting client. Some of the functions provided by an e-business website require authentication. For example, an online trading website must ensure that a customer who logs into the site is providing accurate identification (authentication). A payment server accepts payments online and transfers monetary funds from the customer's financial institution to the merchant's financial institution.

Consider an online bookstore using the architecture depicted in Figure 1. Customers can perform the following functions:

1. Connect to the homepage and browse the website by following links to bestseller books and promotions of the week per book category.

2. Search for titles according to various criteria including keywords, author name, and ISBN.
3. Select a book from a list returned by a search and view additional information about the book such as a brief description, price, shipping time, ranking, and reviews.
4. Register as a new customer of the virtual bookstore. This allows the user to provide a user name and a password, payment information, mailing address, and e-mail address for notification of order status and books of interest.
5. Login with a user name and password.
6. Add items to the shopping cart.
7. Checkout items in the shopping cart.

Miscellaneous Notes:

Assume that the Web Server, Application Server, Database Server are hosted on the same machine. The probability of requesting static pages is 56%.

Statistics show that the average number of visits per function in an online book store is listed in Table 1.

Table 1: Average number of visits for each function

Function	Visit Ratio (# of requests/second)
Entry	1.000
Home	1.862
Browse	2.303
Search	2.193
Login	0.274
Pay	0.058
Register	0.196
Add to Cart	0.193
Select	0.919
Exit	1.000

Deliverables:

1. Your group needs to submit a report that includes:
 - An introduction explaining SPE and performance modeling. The report should also present the reasons for using SPE to model the performance of this online bookstore.
 - Critical use cases for performance. Justify your choice.
 - A sequence diagram for each of the identified critical use cases. These diagrams should make use of references which will be expanded for more detail.

- A software execution model for each sequence diagram you created. You will need to add resource estimates for each node of your software execution model, and solve the model. Table 2 provides the processing overhead matrix.
- A conclusion which explains your findings and recommendations as an SPE engineer for the corporation deploying the online bookstore. You should also discuss any performance problems you uncovered through the model that you have created.

Table 2: Processing Overhead

Device	CPU	Disk	Network
Quantity	1	1	1
Service Unit	KInstr.	Phys. I/O	Msgs.
WorkUnit	10	0	0
DB	1000	1	0
Msgs	20	2	1
Service time	0.00005	0.02	0.03

2. Prepare to deliver a presentation about this project for 10 minutes and submit the presentation to WebCT by 12:00PM on Feb 2, 2015.