

## CHAPTER 11: PHYSICAL ARCHITECTURE LAYER DESIGN

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As with the previous two chapters, this installment of the CD Selections case we see that Alec has spun off part of his team to focus on designing the physical architecture layer. However, given the dependence among the human–computer interaction, data management, and physical architecture layers, this group finds that they must be in relatively constant contact with the other groups. Otherwise, deploying the problem domain, human–computer interaction, and data management layers over the architecture could prove to be difficult. Consequently, Alec has decided to focus his coordination efforts among the different layer groups by heading up the physical architecture layer’s group. He saw this as a way to better understand the implications of deploying the system over multiple, and possibly incompatible, platforms (see the previous installment).

Alec realized that the hardware, software, and networks that would support the new application would need to be integrated into the current infrastructure at CD Selections. Consequently, he had asked Anne to review the high-level nonfunctional requirements developed in the analysis phase (see Figure 3-A) and by conducting a JAD session and a series of interviews with managers in the marketing department and three store managers to refine the nonfunctional requirements into more detail. Figure 11-A shows some of the results. The clear business need for a Web-based architecture required a thin client–server architecture for the Internet sales portion of the system.

CD Selections had a formal architecture group responsible for managing CD Selections architecture and its hardware and software infrastructure. Therefore, Anne set up a meeting with the development team and the architecture group. During the meeting, she confirmed that CD Selections was still moving toward a target client–server architecture, although the central mainframe still existed as the primary server for many server-based applications.

They discussed the Internet system and decided that it should be built using a three-tier thin client–server architecture. Everyone believed that it was hard to know at this point exactly how much traffic this Web site would get and how much power the system would require, but a client–server architecture would allow CD Selections to easily scale up the system as needed.

By the end of the meeting, it was agreed that a three-tiered client–server architecture was the best configuration for the Internet portion of the Internet sales system (i.e., the Place Order process in Figures 4-D and 4-G). Customers would use their personal computers running a Web browser as the client. A database server would store the Internet system’s databases; whereas, an application server would have Web server software and the application software to run the system.

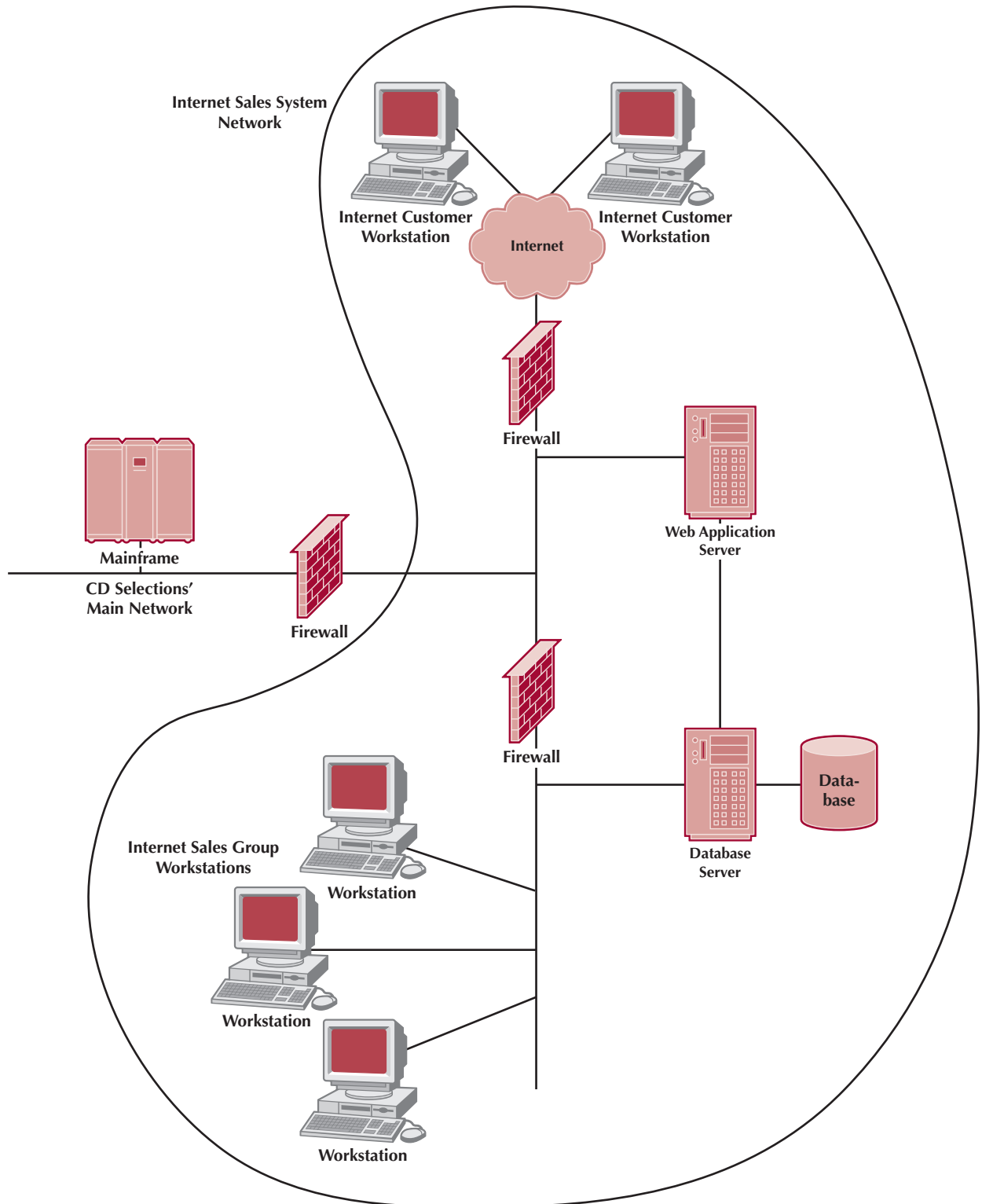
A separate two-tier client server system will maintain the CD and CD Marketing Material information (i.e., see Figure 4-D). This system will have an application for the personal computers of the staff working in the Internet sales group that communicates directly with the database server and enables staff to update the information. The database server will have a separate program to enable it to exchange data with CD Selections’ distribution system on the company mainframe. Furthermore, the in-store system was currently built using a two-tier client–server architecture, so the portion of the system responsible for the in-store holds would conform to that architecture.

Next, Anne created a network model to show the major components of the Internet sales system (see Figure 11-B). The Internet sales system is on a separate network segment separated from the CD Selections’ main network by a firewall that separates the network

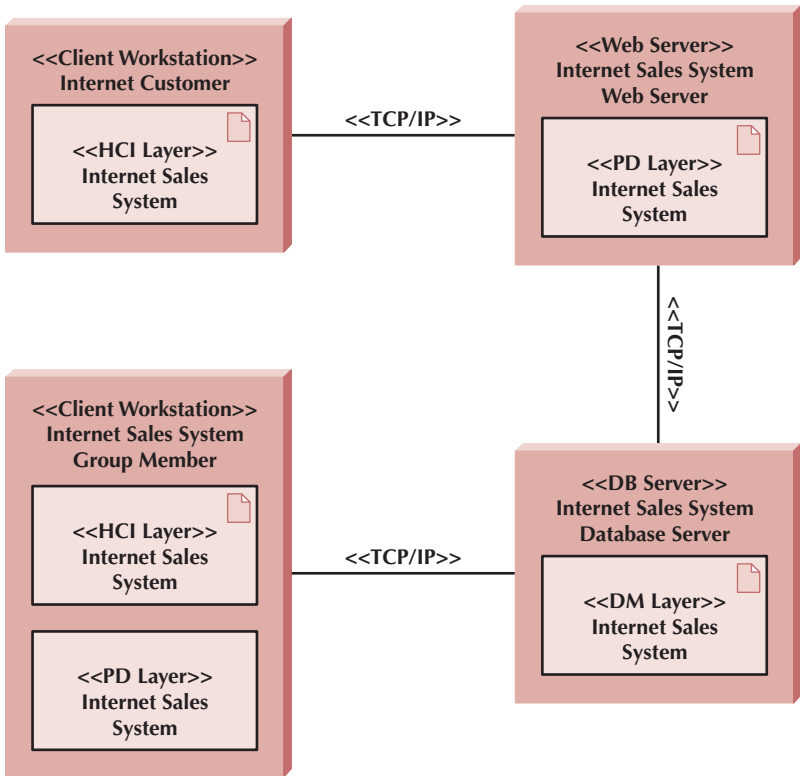
<b>1. Operational Requirements</b>	
Technical Environment	<div>1.1 The system will work over the Web environment with Internet Explorer and Real Audio.</div> <div>1.2 Customers will only need Internet Explorer and RA on their desktops.</div>
System Integration	<div>1.3 The Internet sales system will read information from the main CD information database, which contains basic information about the CD (e.g., title, artist, id number, price, quantity in inventory). The Internet order system will not write information to the main CD information database.</div> <div>1.4 The Internet sales system will transmit orders for new CDs in the special order system, and will rely on the special order system to complete the special orders generated.</div> <div>1.5 The Internet sales system will read and write to the main inventory database.</div> <div>1.6 A new module for the In-store system will be written to manage the “holds” generated by the Internet system. The requirements for this new module will be documented as part of the Internet sales system because they are necessary for the Internet sales system to function.</div> <div>1.7 A new module will be written to handle the mail order sales. The requirements for this new module will be documented as part of the Internet sales system because they are necessary for the Internet sales system to function.</div>
Portability	<div>1.8 The system will need to remain current with evolving Web standards, especially those pertaining to music formats.</div>
Maintainability	<div>1.9 No special maintainability requirements are anticipated.</div>
<b>2. Performance Requirements</b>	
Speed	<div>2.1 Response times must be less than 7 seconds.</div> <div>2.2 The inventory database must be updated in real time.</div> <div>2.3 In-store holds must be sent to the store within 5 minutes.</div>
Capacity	<div>2.4 There will be a maximum of 20–50 simultaneous users at peak use times.</div> <div>2.5 The system will support streaming audio to up to forty simultaneous users.</div> <div>2.6 The system will send up to 5K of data to each store daily.</div> <div>2.7 The in-store hold database will require 10–20K of disk space per store.</div>
Availability and Reliability	<div>2.8 The system should be available 24/7.</div> <div>2.9 The system shall have 99 percent uptime performance.</div>
<b>3. Security Requirements</b>	
System Value	<div>3.1 No special system value requirements are anticipated.</div>
Access Control	<div>3.2 Only store managers will be able to override In-Store Holds.</div>
Encryption/Authentication	<div>3.3 No special encryption/authentication requirements are anticipated.</div>
Virus Control	<div>3.4 No special virus control requirements are anticipated.</div>
<b>4. Cultural and Political Requirements</b>	
Multilingual	<div>4.1 No special multilingual requirements are anticipated.</div>
Customization	<div>4.2 No special customization requirements are anticipated.</div>
Unstated Norms	<div>4.3 No special unstated norms requirements are anticipated.</div>
Legal	<div>4.4 No special legal requirements are anticipated.</div>

**FIGURE 11-A** Selected Nonfunctional Requirements for the CD Selections Internet Sales System

from the Internet while granting access to the Web and database servers. The Internet sales system has two parts. A firewall is used to connect the Web/Application server to the Internet, while another firewall further protects the Internet sales group’s client computers and database server from the Internet. In order to improve response time, a direct connection is made from the Web/Application server to the database server because these will



**FIGURE 11-B** Deployment Diagram of Network Model for the CD Selections Internet Sales System



**FIGURE 11-C**  
Deployment Diagram  
of Layers for the CD  
Selections Internet  
Sales System

exchange a lot of data. Based on these decisions, she also created a deployment diagram that shows how the problem domain, human computer interaction, and data management layers would be deployed over the physical architecture layer (see Figure 11-C).

Given that the Web interface could reach a geographically dispersed group, the development team realized that it needed to plan for 24/7 system support. As such, Anne scheduled a meeting to talk with the CD Selections systems operations group and discussed how they might be able to support the Internet system outside of standard working hours.

After examining the network model, the architecture group and the development team decided that the only components that needed to be acquired for the project were a database server, a Web server, and five new client computers for the marketing group, who will maintain the CD marketing materials. They developed a hardware and software specification for these components and handed them off to the purchasing department to start the acquisition process.