

Content Formatting Platform For Mobile Devices

Today, most Web sites have been built around web content stored in HTML format. While HTML has remained the basis for all web content, we are about to witness the revolutionary move of content from HTML to XML. A new content formatting paradigm is needed to efficiently support the ever-growing number of mobile devices. Our content formatting platform is a new method for architecting Internet systems using four distinct components. We introduce a presentation server to solve the problems brought on by the proliferation of devices and content types.

The Problem

The strength of HTML comes from its rendering capability for a specific set of clients, namely traditional HTML-based web browsers. Cell phones, PDAs and embedded devices are not equipped with powerful rendering systems or large display screens. The technical challenge is to design a content formatting platform, which extends the traditional three-tier architecture and allows for new content formats with very little additional development effort.

Complexities of Content

The variety of Internet enabled devices has multiplied considerably. A few years ago, users only expected to access content from different PC browsers. Today, the same content needs to be accessible from multiple devices with vastly different capabilities.

In addition, content has become more complex than ever before. Each content type, be it data, audio or video content, requires a different set of technologies for storage, processing, serving and rendering. Managing the combination these technologies is a complex process and is not entirely accounted for in our current platform model. In the future audio and video components must be integrated seamlessly and content mixtures must be synchronized and served to clients.

With the advent of XML, any data can be described in a technology neutral way. XML is a set of rules for defining a document using tags in a self-describing vendor- and technology-neutral manner. The key advantage here is that XML allows content to be transformed into a wide range of presentation formats. Approaching content in this way validates a novel software architecture, which separates the user interface and the application server (middle-tier). This new layer enables the author to create the content once and just apply transformation logic to reach various client devices.

Four-Tier Architecture

A three-tier architecture has been the prevailing design for Internet systems during the past few years. In this design, as seen in Figure 1, there are three distinct components: database, application server and client browser. The three-tier architecture was considered an evolutionary step over the client server model. It removed the business logic from the client and the database and placed it into an application server. This architecture enabled systems to scale larger and become more reliable by implementing various forms of fail-over at a lower cost.

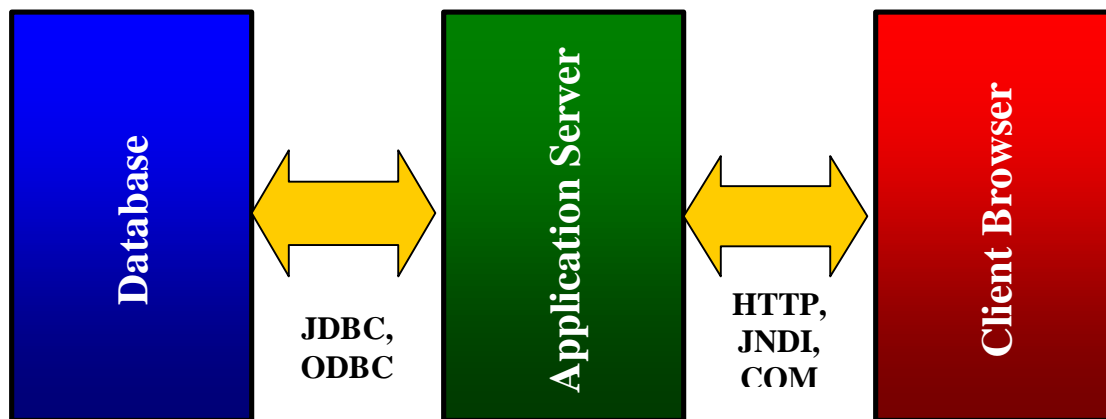


Figure 1: Traditional Three-Tier Architecture

The four-tier architecture will solve the problem of disparate content types by abstracting and removing the data and presentation logic from both the client and the application server. The new presentation server is responsible for gathering content, client capabilities and user settings and preparing them to serve the client. Figure 2 shows the basic four-tier architecture. In the four-tier architecture model, the database server remains the data storage and retrieval mechanism and the application server continues to act as the container for implemented business logic. The presentation server becomes the contact point for the client. All requests and responses originate there.

The response sent by the presentation server to the client contains metadata for the audio and video content. The actual audio and video is still served by dedicated multimedia servers. The application server has access to the audio and video content server to facilitate its interaction with the metadata of those media types.

For each incoming request, the presentation server performs one of two functions:

- Send one or more requests to the application server and other content servers
- Retrieve cached content and return it to the client

The presentation server formats the data received from content servers according to the presentation logic, the client device capabilities and the content type. The presentation server abstracts all presentation logic from the client and the application server and sends the appropriate data when it is requested.

Presentation Server

The presentation server in Figure 2 is an application running inside a server with the primary purpose of implementing all presentation logic. Even though it is merely an application running in an environment similar to the application server, it should be viewed as a subsystem separate from the application server and the content management system. The application and presentation servers are separate systems. Each set of functionality will have different requirements for scaling, fail-over, performance and deployment.

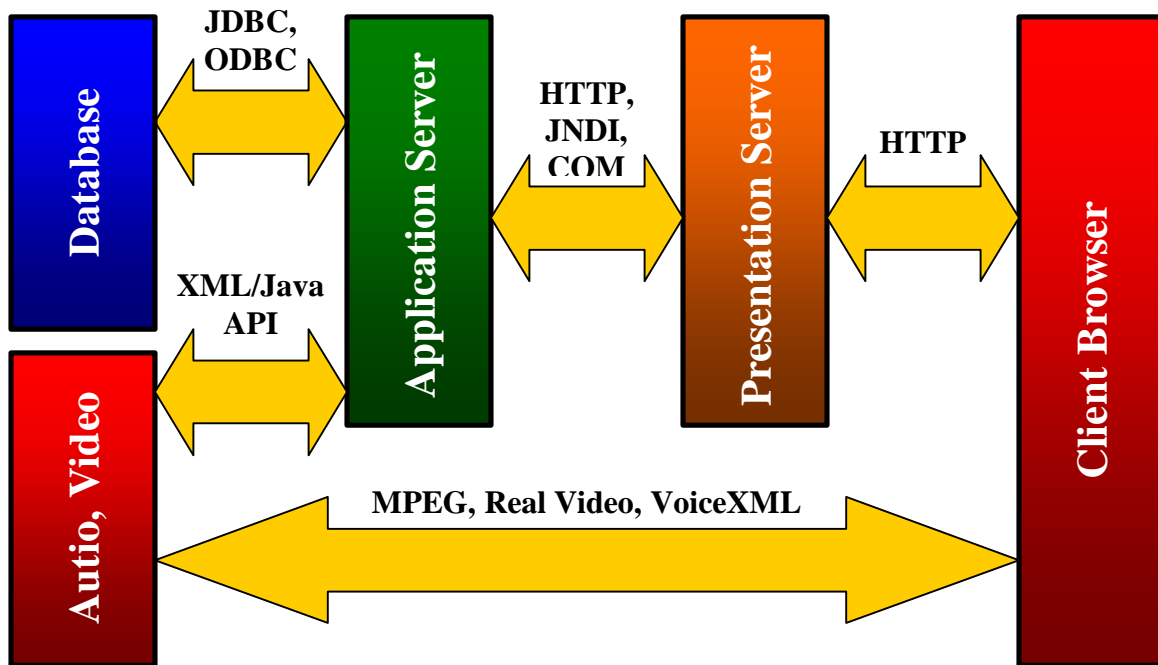


Figure 2: Four-Tier Architecture With Presentation Server

It is important that the presentation server be kept as stateless as possible. The application server should handle all states, such as session information and transactions. The presentation of data whether it is device dependent, user dependent or content dependent, is stateless. There may be exceptions to this statelessness with implementation features such as caching and content synchronization. The original client request to the presentation server is typically made over HTTP. The output of the presentation server to the client is the result of changes to the content coming from the application server. The presentation server requests and receives data from the application server using a variety of techniques including stateful protocols such as RMI, JNDI, IIOP or stateless protocols such as HTTP with or without some XML based protocols such as SOAP or XML-RPC.

Conclusion

We introduced a presentation server, which divides the traditional three-tier Internet architecture into four tiers. The presentation server solves the problems introduced by the proliferation of devices and content types. The presentation server abstracts all presentation logic from the client and the application server. It performs all presentation formatting before the response is sent to the client. The four-tier architecture will drastically reduce the length of web development cycles and cleanly separate development efforts.