THESIS

NETWORK APPLICATION SERVER USING EXTENSIBLE MARK-UP LANGUAGE (XML) TO SUPPORT DISTRIBUTED DATABASES AND 3D ENVIRONMENTS

by

Clifton James Williams

December 2001

Thesis Advisor: Don Brutzman
Thesis Advisor: Daniel Dolk

Approved for public release; distribution is unlimited
<table>
<thead>
<tr>
<th><strong>Report Date</strong></th>
<th>19 Dec 2001</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Report Type</strong></td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Dates Covered</strong></td>
<td>(from... to)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Title and Subtitle</strong></th>
<th>NETWORK APPLICATION SERVER USING EXTENSIBLE MARK-UP LANGUAGE (XML) TO SUPPORT DISTRIBUTED DATABASES AND 3D ENVIRONMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Author(s)</strong></td>
<td>Williams, Clifton</td>
</tr>
<tr>
<td><strong>Performing Organization Name(s) and Address(es)</strong></td>
<td>Naval Postgraduate School Monterey, California</td>
</tr>
<tr>
<td><strong>Sponsoring/Monitoring Agency Name(s) and Address(es)</strong></td>
<td></td>
</tr>
</tbody>
</table>

| **Abstract** |  |
| **Subject Terms** |  |

| **Report Classification** | unclassified |
| **Classification of Abstract** | unclassified |

| **Distribution/Availability Statement** | Approved for public release, distribution unlimited |
| **Supplementary Notes** | The original document contains color images. |

| **Number of Pages** | 309 |

| **Report Classification** | Classification of this page |
| **Classification of Abstract** | Limitation of Abstract |

| **Contract Number** |  |
| **Grant Number** |  |
| **Program Element Number** |  |
| **Project Number** |  |
| **Task Number** |  |
| **Work Unit Number** |  |
| **Performing Organization Report Number** |  |
| **Sponsor/Monitor’s Acronym(s)** |  |
| **Sponsor/Monitor’s Report Number(s)** |  |
This thesis contributes to the US Navy forces maintaining information superiority in a Network Centric Warfare environment. This research develops an Extensible Markup Language (XML)-based Web Publishing Framework, which supports the Web Enabled Navy (WEN) architecture infrastructure. The Web application framework easily supports connections to multiple distributed databases and XML-based presentations, specifically three-dimensional (3D) simulations utilizing Extensible 3D (X3D) and Virtual Reality Modeling Language (VRML). This research evaluates and demonstrates the functionality of an XML-based Web Publishing Framework. The research demonstrates ability to connect to both XML and non-XML heterogeneous database systems and provides a framework for the distribution data across heterogeneous systems. The system supports usage in multi-tier network architecture. 3D modeling and simulations provide insights into operations that cannot be realized using standard two-dimensional (2D) renditions.

The development of an application server to support 3D modeling and simulations for operational planning will provide the U.S. Navy a better way of realizing operational limits. This research addresses the Web publishing framework, which supports the development XML based data exchange, and the development of an “on the fly” X3D simulation presentation. This research evaluated the functionality of an XML based Web framework, which allows for the separation between application programming and Web presentation. This incorporation of a Model, View, and Controller (MVC) design approach provides a clean separation between different components (logic, presentation, and data) of information and the programming functionality. The Web framework addressed ability to provide a framework for the distribution data across heterogeneous systems.
Approved for public release; distribution is unlimited

NETWORK APPLICATION SERVER USING EXTENSIBLE MARK-UP LANGUAGE (XML) TO SUPPORT DISTRIBUTED DATABASES AND 3D ENVIRONMENTS

Clifton J. Williams
Lieutenant, United States Navy
B.E.E., Auburn University, 1993

Submitted in partial fulfillment of the requirements for the degree of
MASTER OF SCIENCE IN COMPUTER SCIENCE

and

MASTER OF SCIENCE IN INFORMATION SYSTEMS TECHNOLOGY

from the

NAVAL POSTGRADUATE SCHOOL

December 2001

Author: Clifton J. Williams

Approved by: Don Brutzman, Thesis Advisor
Daniel R. Dolk, Thesis Advisor

LCDR Chris Eagle, Chair
Computer Science Department

George Connor, Chair
Information Systems Academic Group
ABSTRACT

Advances in computer communication technology and an increased awareness of how enhanced information access can lead to improved capabilities, are the driving forces behind the interest in the integration of current distributed systems and stand-alone systems. However, differences in hardware, software architectures, operating systems, host languages, and data representation have resulted in scores of stovepipe system architectures that are unable to interoperate properly.

This thesis contributes to the US Navy forces’ information superiority in a Network Centric Warfare environment. This research develops an Extensible Markup Language (XML) based Web application framework, which supports the Web Enabled Navy (WEN) architecture infrastructure. The Web application framework easily supports connections to multiple distribute databases and XML-based presentations specifically three-dimensional (3D) simulations utilizing Extensible 3D (X3D) and Virtual Reality Modeling Language (VRML).

This research evaluates and demonstrates the functionality of an XML-based Web framework. The framework allows for the separation between application programming and Web presentation. The research demonstrates ability to connect to both XML and non-XML heterogeneous database systems and provides a framework for the distribution data across heterogeneous systems. The system supports usage in multi-tier network architecture. 3D modeling and simulations provide insights into operations that are unrealized using standard two-dimensional (2D) renditions. Today’s planning and modeling systems use 2D representations of the 3D battle-space. This presents a challenge for planners, commanders, and operators to understand the true nature of the battle-space with regards to the easiest routes to take, places to take cover, obstacles which may impede traffic, and places where the enemy may be hiding, to name a few.

The development of an application server to support 3D modeling and simulations for operational planning will provide the U.S. Navy a better way of realizing operational limits. This research addresses the Web application framework, which supports the development XML-based data exchange, and the development of an “on the fly” X3D simulation presentation.
THIS PAGE INTENTIONALLY LEFT BLANK
## Table of Contents

### I. Introduction
- A. Problem Statement ................................................................. 1
- B. Background .................................................................................. 2
- C. Problem .......................................................................................... 3
- D. Root Cause ....................................................................................... 4
- E. Methodology ...................................................................................... 6
- F. Scope .................................................................................................. 6
- G. Chapter Outline ................................................................................. 7

### II. Web Publishing Frameworks
- A. Introduction .................................................................................... 9
- B. Overview ............................................................................................ 9
- C. Selecting a Framework ...................................................................... 11
  1. Product Stability ............................................................................. 11
  2. XML Tools and API Support ........................................................ 12
  3. Heterogeneous Environments ........................................................ 12
  4. Market Presence ............................................................................. 13
  5. Making the Decision ...................................................................... 13
- D. Objects .............................................................................................. 15
- E. Interoperability ............................................................................... 15
- F. Model .................................................................................................. 16
- G. Construction of a Web Publishing Framework ............................. 17
  1. Apache Web Server ...................................................................... 18
  2. Tomcat Servlet Engine .................................................................. 21
  3. Cocoon Publishing Framework ....................................................... 23

### III. Technological Interoperability Enablers
- A. Introduction .................................................................................... 27
  1. Directives ........................................................................................ 27
  2. Web Frameworks Technology Needs ............................................ 27
  3. Cost Reduction ............................................................................... 28
- B. XML: The New Lingua-Franca ...................................................... 28
  1. XML basics .................................................................................... 28
  2. Well-formedness ............................................................................ 29
  3. Validity ........................................................................................... 29
- C. Constraining Content .................................................................. 30
  1. DTD ............................................................................................... 30
  2. XML Schema ................................................................................. 30
- D. Programmatic Access ................................................................... 33
  1. SAX ............................................................................................... 33
  2. DOM ............................................................................................. 33
  3. SAX vs. DOM ................................................................................ 33
- E. Translations Extensible Styles Language (XSL) .......................... 34
- F. Extensible Hypertext Markup Language (XHTML) ....................... 37
<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. INTRODUCTION</td>
<td>93</td>
</tr>
<tr>
<td>B. INSTALLATION OF COCOON WEB PUBLISHING FRAMEWORK</td>
<td>93</td>
</tr>
<tr>
<td>C. INSTALLING JAVA VIRTUAL MACHINE</td>
<td>97</td>
</tr>
<tr>
<td>D. INSTALLING JAKARTA ANT</td>
<td>98</td>
</tr>
<tr>
<td>E. INSTALLING APACHE</td>
<td>106</td>
</tr>
<tr>
<td>F. INSTALLING JAKARTA-TOMCAT SERVLET ENGINE</td>
<td>108</td>
</tr>
<tr>
<td>G. CONFIGURING TOMCAT SERVLET ENGINE TO OPERATE WITH THE APACHE WEB SERVER</td>
<td>114</td>
</tr>
<tr>
<td>H. BUILDING MOD_JK FOR WINDOWS</td>
<td>114</td>
</tr>
<tr>
<td>I. CONFIGURING APACHE</td>
<td>115</td>
</tr>
<tr>
<td>J. CUSTOM CONFIGURATION OF TOMCAT MOD_JK.CONF</td>
<td>116</td>
</tr>
<tr>
<td>K. CONFIGURING TOMCAT</td>
<td>117</td>
</tr>
<tr>
<td>L. INSTALLING COCOON 1.8.2</td>
<td>119</td>
</tr>
<tr>
<td>M. INSTALLING MICROSOFT XML PARSER (MSXML) 4.0 FOR INTERNET EXPLORER</td>
<td>131</td>
</tr>
<tr>
<td>N. INSTALLING VIRTUAL REALITY MODELING LANGUAGE (VRML) AND X3D-EDIT</td>
<td>132</td>
</tr>
<tr>
<td>O. INSTALLING ADOBE PORTABLE DOCUMENT FORMAT (PDF) READER</td>
<td>132</td>
</tr>
<tr>
<td>APPENDIX C. EXTENSIBLE HTML</td>
<td>133</td>
</tr>
<tr>
<td>A. INTRODUCTION</td>
<td>133</td>
</tr>
<tr>
<td>B. HTML NPS XML SERVER HOME PAGE</td>
<td>133</td>
</tr>
<tr>
<td>C. HTML BROWSER OUTPUT</td>
<td>136</td>
</tr>
<tr>
<td>D. XHTML NPS XML SERVER HOME PAGE</td>
<td>136</td>
</tr>
<tr>
<td>E. XHTML TRANSITIONAL DTD</td>
<td>139</td>
</tr>
<tr>
<td>F. XHTML BROWSER OUTPUT</td>
<td>159</td>
</tr>
<tr>
<td>APPENDIX D. JAVA SERVLET AND JSP EXAMPLES</td>
<td>161</td>
</tr>
<tr>
<td>A. INTRODUCTION</td>
<td>161</td>
</tr>
<tr>
<td>B. JSP FORM</td>
<td>161</td>
</tr>
<tr>
<td>C. HTML FORM</td>
<td>163</td>
</tr>
<tr>
<td>D. SERVLET</td>
<td>163</td>
</tr>
<tr>
<td>APPENDIX E. WEB PUBLISHING FRAMEWORK’S SOURCE CODE USING SERVLETS FOR GENERIC DATABASE ACCESS</td>
<td>167</td>
</tr>
<tr>
<td>A. INTRODUCTION</td>
<td>167</td>
</tr>
<tr>
<td>B. GENERICXMLJDBCACCESS JAVA SOURCE CODE</td>
<td>167</td>
</tr>
<tr>
<td>C. JDBCXMLDB JAVA SOURCE CODE</td>
<td>170</td>
</tr>
<tr>
<td>D. JDBCXHTMLDB JAVA SOURCE CODE</td>
<td>171</td>
</tr>
<tr>
<td>E. XML DATABASE XML OVER HTTP OUTPUT</td>
<td>172</td>
</tr>
<tr>
<td>F. JDBCHTML STYLESHEET XML SOURCE CODE</td>
<td>175</td>
</tr>
<tr>
<td>G. XHTML INTERFACE FORM XHTML SOURCE CODE</td>
<td>176</td>
</tr>
<tr>
<td>APPENDIX F. WEB PUBLISHING FRAMEWORK’S SOURCE CODE USING COCOON FOR GENERIC DATABASE ACCESS</td>
<td>179</td>
</tr>
<tr>
<td>A. INTRODUCTION</td>
<td>179</td>
</tr>
</tbody>
</table>
LIST OF FIGURES

Figure II.1  Cocoon Web Publishing Framework...............................................................16
Figure II.2  Cocoon Web Publishing Framework...............................................................18
Figure II.3  Java Servlet Engine and Web Server Relationship..........................................22
Figure II.4  Cocoon processing model................................................................................23
Figure III.1  Simple XML Document...................................................................................29
Figure III.2  XML Schema as designed in XMLSPY ..........................................................31
Figure III.3  XML Schema...................................................................................................32
Figure III.4  Simple Example Stylesheet..............................................................................35
Figure III.5  Simple Example Browser Display.....................................................................36
Figure III.6  Example of bad HTML....................................................................................37
Figure III.7  HTML to XHTML Conversion..........................................................................38
Figure III.8  HTML Component Example ............................................................................40
Figure III.9  XML Component Example .............................................................................40
Figure IV.1  Generic Database Access Web Publishing Framework.....................................47
Figure IV.2  JAVA Servlet and XML database generic connection architecture ..................50
Figure IV.3  GenericXMLJdbcAccess.Class Execute( ) Method...........................................51
Figure IV.4  JdbcXhtmlDB.class doGet( ) Method..............................................................53
Figure IV.5  XHTML interface form....................................................................................54
Figure IV.6  XML database generic connection architecture...............................................55
Figure IV.7  GenericESQL.XML Document ........................................................................57
Figure IV.8  GenericESQL HTML over HTTP Browser Display ........................................58
Figure V.1  XML-based Web Publishing Framework for X3D/VRML.................................62
Figure V.2  Screen Capture of the X3D Edit Tool...............................................................65
Figure V.3  X3DCocoon Selection Servlet XHTML Input Form.........................................66
Figure V.4  X3D Cocoon Servlet Architecture...................................................................67
Figure V.5  X3DCocoon Servlet Multiple XML document Processing ...............................69
Figure V.6  HelloWorld Text Display................................................................................70
Figure V.7  XML database generic connection architecture...............................................71
Figure V.8  HelloWorld or CocHelloWorld VRML display ................................................72
Figure V.9  CocKelpForest VRML display...........................................................................73
Figure V.10  CocAmphibiousRaid VRML display...............................................................74
Figure B.1  Windows Control Panel Display.......................................................................99
Figure B.2  Windows System Properties Display...............................................................100
Figure B.3  Windows Environment Variables Display.......................................................101
Figure B.4  Windows New User Variables Input Display Panel..........................................101
Figure B.5  ANT Output ...................................................................................................105
Figure B.6  Apache Output ..............................................................................................107
Figure B.7  Initial startup page........................................................................................108
Figure B.8  DOS Window Tomcat startup.bat.................................................................112
Figure B.9  DOS Window Tomcat startup.bat.................................................................112
Figure B.10 Tomcat Servlet Engine running ...................................................................113
| Figure B.11 | Tomcat Servlet Engine running | .................................................................................. 113 |
| Figure B.12 | Apache httpd.conf Configuration File | ............................................................................. 116 |
| Figure B.13 | Windows Display of C:/Jarakata-Tomcat-3.2.3/lib | .............................................................................. 121 |
| Figure B.14 | Server.XML file | ................................................................................... 122 |
| Figure B.15 | Cocoon.conf File | .................................................................................. 124 |
| Figure B.16 | Apache httpd.conf Configuration File | ............................................................................. 125 |
| Figure B.17 | File Directory Structure Tomcat with Cocoon | .............................................................................. 126 |
| Figure B.18 | Directory Location Web.xml | .................................................................................. 127 |
| Figure B.19 | Web.xml Source Code | .................................................................................. 128 |
| Figure B.20 | Directory Location of Cocoon Samples | .............................................................................. 129 |
| Figure B.21 | Cocoon Index.xml Display | .................................................................................. 130 |
| Figure B.22 | Cocoon.xml Display | .................................................................................. 131 |
LIST OF TABLES

Table II.1  Cocoon Web Publishing Framework ...............................................................14
Table B.1   Listing Of Configuration System Using Cocoon .............................................97
Table B.2   Cocoon jar files requirements ........................................................................120
LIST OF SYMBOLS, ACRONYMS, AND/OR ABBREVIATIONS

2D Two-Dimensional
3D Three-Dimensional
API Application Program Interface
ASP Active Server Pages
COE Common Operating Environment
CSS Cascading Style Sheet
CGI Common Gateway Interface
CPU Central Processing Unit
DAP Directory Access Protocol
DBA Database Administrator
DBMS Database Management System
DHTML Dynamic Hyper Text Markup Language
DII Defense Information Infrastructure
DISA Defense Information Systems Agency
DoD Department of Defense
DOM Document Object Model
DMSO Defense Modeling and Simulation Office
DTD Data Type Definition
EJB Enterprise Java Beans
ESQL Extensible Standard Query Language Tag Library
FO Formatted Object
FOP Formatted Objects Processor
FTP File Transfer Protocol
GNP Gross National Product
GUI Graphical User Interface
HTML Hyper Text Markup Language
HTTP Hyper Text Transfer Protocol
IDE Integrated Development Environment
IIS Internet Information Server
J2EE Java 2 Enterprise Edition
JAXP Java API for XML Processing
JDBC Java Database Connection
JNDI JAVA Naming and Directory Interfaces
JSP Java Server Pages
JVM Java Virtual Machine
LDAP Lightweight Directory Access Protocol
MGRS Military Grid Reference System
MVC Model, View, Controller
NCSA National Center for Supercomputing Applications
NXI Navy XML Infrastructure
OOP Object-Oriented Programming
ODBC Object Database Connection
PDA  Personal Digital Assistant  
PDF  Portable Document Format  
RDBMS  Relational Database Management Systems  
RMI  Remote Method Invocation  
ROE  Rules of Engagement  
SAX  Simple API for XML  
SQL  Standard Query Language  
SRS  Software Requirements Specification  
SSL  Secure Socket Layer  
SVG  Scalable Vector Graphics  
TCP/IP  Transmission Control Protocol/ Internet Protocol  
TBD  To Be Determined  
URI  Uniform Resource Indicator  
URL  Uniform Resource Locator  
USMC  United States Marine Corps  
USMTF  United States Message Text Forma  
USN  United States Navy  
VRML  Virtual Reality Modeling Language  
W3C  World Wide Web Consortium  
WAN  Wide Area Network  
WAP  Wireless Access Protocol  
WEN  Web Enabled Navy  
WML  Wireless Markup Language  
WWW  World Wide Web  
X3D  Extensible 3D Markup Language  
XHTML  Extensible Hypertext Markup Language  
Xlink  XML Link References  
XML  Extensible Mark-up Language  
XML-FO  Extensible Markup Language Formatting Object  
XML-MTF  Extensible Markup Language Message Text Format  
Xpath  XML Path Language  
XPointer  XML Pointer References  
XSL  Extensible Stylesheet Language  
XSL-FO  XSL Formatting Objects  
XSLNS  XSL Name Space  
XSLT  XSL Transformations  
XSP  Extensible Server Pages  
XSSI  Extended server side includes
ACKNOWLEDGMENTS

First, I would thank God for answering my prayers and truly blessing me here at Monterey with the opportunity to advance my education in the computer industry. All my knowledge and wisdom flows from him. Second, I thank my beautiful wife and best friend Nancy, my triplet sons Colin, Ryan and Nicholas and son Clifton for making life truly worth living. Lastly, I owe a debt of gratitude to my fellow students and instructors who have made my time here at NPS a very pleasant and memorable experience.

-- Clifton J. Williams
I. INTRODUCTION

A. PROBLEM STATEMENT

Extensible Mark-up Language (XML) based Web application framework provides a system for the distribution of data across heterogeneous systems. An XML-based Web framework allows for the separation between application programming and Web presentation. This type of application server supports connections between both XML and non-XML heterogeneous database systems. The Web frame supports hypertext markup language (HTML) as well as XML. An XML-based Web Publishing Framework provides a framework for distributing and visualizing three-dimensional simulation utilizing Extensible 3D (X3D) and Virtual Reality Modeling Language (VRML) over a wide area network (WAN). This framework supports the use of multiple Extensible Stylesheet Language (XSL) Stylesheets, to enable translations between XML information and VRML three-dimensional objects.

The purpose of this thesis is to support information superiority in a Network Centric environment and support the Web Enabled Navy (WEN) Architecture infrastructure. The objective of this research is to demonstrate and evaluate the functionality of an XML-based Web framework, which allows for the separation between application programming and Web presentation. The Web framework research will demonstrate ability to connect to both XML and non-XML heterogeneous databases and provide a framework for distributing data across heterogeneous systems. The Web framework supports the Navy Extensible Mark-up Language Infrastructure (NXI). The XML based Web application framework provides a framework for distributing and visualizing three-dimensional simulation utilizing X3D and VRML. Specifically, this thesis illustrates the development of an XML-based Application Server that supports the use of multiple XSL stylesheets to enable translations between XML information and VRML three-dimensional object representations.
B. BACKGROUND

Current littoral operations doctrine still uses the command and control systems established to handle the Russian threat in a blue-water, open ocean environment. In the past, when the US Naval Force deployed, the information exchange between the Battle group units came via hardcopy naval message, tactical data links, and voice and data radio circuits. Battle group units were responsible for various warfare areas in a decentralized command and control structure governed by the commander’s intent and rules of engagement (ROE). Sensors and weapons belonged to individual battle group units and each unit was responsible for their safe and effective employment in accordance with the commander’s intent. Special instructions, supplemental ROE, and pre-planned responses in accordance with battle group operating orders were in place to handle rapid changes in the tactical situations.

The Navy and Marine Corps of 2020 will more frequently operate in the littoral, conducting the core missions of Undersea Warfare, Air Warfare, Surface Warfare, and Land Attack. A networked infrastructure that will leverage battle-group firepower and sensor capabilities will need to support these rapidly changing littoral environment operations. Sensors and weapons will no longer be “stove piped” to one unit. To conduct operations in this manner, new types of operation simulation planning and battle-space awareness will be needed that enable a more robust flow of information between the units in a manner that ensures timeliness, and is sufficient to handle the added complexity of the littoral environment.

The US Navy communications infrastructure must support the deployment of forces for operations. Internet type Transmission Control Protocol/Internet Protocol (TCP/IP) information exchange systems will require transferring data between senders and receivers. “Information superiority will enhance the capability of joint force commander to understand the situation, determine the effects desired, select a course of action and the forces to execute it, accurately assess the effects of the action, and reengage as necessary while minimizing collateral damage.” [Joint Vision 2020, PG 22] This research will contribute to the US Navy forces’ information superiority in a Network
Centric Warfare environment. This research develops an XML-based Web application framework, which supports the WEN architecture infrastructure. [WEN01] The proposed Web application framework easily supports distribute databases and XML-based presentations specifically three-dimensional simulations utilizing X3D and VRML. The system supports incorporation into a multi-tier network architecture to link various organic and inorganic actors in a virtual Combat Information Center. Three-dimensional (3D) modeling and simulations provide insights into operations, which cannot be unrealized using standard two-dimensional (2D) renditions. The development of an application server to support three-dimensional modeling and simulations for operational planning will provide the U.S. Navy a better way of realizing operational limits. The research seeks to address the Web application framework which supports the development XML-based data exchange and the development of an on fly X3D simulation presentations.

C. PROBLEM

The principal problem to be resolved is how to share information between two or more systems using the current Web framework. Ancillary questions are how to extend current relational database management systems (RDBMS) to support the current Web technology using large data storage systems, how to enable application servers to quickly change information representations in support of 3D simulations, how to achieve these objectives in an environment consisting of heterogeneous databases across heterogeneous systems. An XML-based Web framework application server provides the solution to these issues.

This research demonstrates and evaluates the functionality of an XML based Web framework, which allows for the separation between application programming and Web presentation. The Web framework research demonstrates ability to connect to both XML and non-XML heterogeneous database systems and provides a framework for the distribution data across heterogeneous systems. The XML-based Web Publishing Framework provides a framework for distributing and visualizing three-dimensional simulation utilizing X3D and VRML.
D. ROOT CAUSE

The Defense Information Infrastructure (DII) Master Plan states “Information Technology infrastructure is composed of many disparate underlying computing configurations, designed and implemented at different times to meet different requirements.” Given the varying perceived service-specific requirements of DoD users and the distributed execution authority within DoD, it is reasonable to assume that heterogeneity of our systems will continue to be prevalent [DII98].

Heterogeneity is inevitable and is a phenomenon we must handle effectively to deal with if we are to control costs and realize the full potential of our investments. Increased costs are due to two factors. First, many of these systems unintentionally produce similar or complementary information. Second, advances in computer communications and networking technologies, a shrinking defense budget, and an increase in joint and combined operations now make it possible and necessary to integrate. Funding is not available to procure new integrated network-centric systems to replace the thousands of DoD legacy systems currently operating and produced under the stand-alone / closed-system paradigm.

The proliferation of these non-interoperable legacy systems has imposed delays, costs, and friction in nearly every area of the military. By conservative estimates, about 2 percent of the gross national product (GNP) can be attributed to inefficiencies such as redundant information entry, data conversion and system incompatibilities [SB01]. The United States, having a GNP greater than 9.8 trillion dollars in 2000 [OECD01], wasted at least 197 billion dollars on these inefficiencies. To put this in perspective, these inefficiencies amount to more than double the total same year budget of the Navy and Marine Corps combined [DL99].

The cost of not integrating is overwhelmingly evident. As the defense budget shrinks, these inefficiencies will take a larger slice of the total and result in less funding needed to strengthen our war fighting capabilities. DoD must move to meet the
computing goal of evolved ability and interoperability within this heterogeneous environment in the most intelligent and cost efficient manner.

The current method for integration of legacy systems involves a careful, time-intensive study of a producer system’s exported information. The system integrator then determines if this information is of value to a consumer system and what formatting or transformations are required. After mapping the exported data type to the imported data type, the system integrator then writes a software “wrapper” which will perform a translation from the producer’s representation to the consumer’s. Unfortunately, this cycle repeats for every new piece of information a consumer or producer would like to make available to the system. Currently there is little or no computer assistance for performing this task. [Lytt00]

The approach proposed by this thesis is to use an XML Web application server as a more efficient means of providing systems interoperability and then to develop XSL stylesheets to enable automated translations between XML and users’ desired system outputs. This approach will also allow the DoD to lower system integrations costs. An XML-based Web framework will allow the isolation of internal code of legacy systems with an XML “wrapper”. The framework will view each system input as a black box and deal only with the interfaces. This system allows for heterogeneous distributed database connections, which support XML and non-XML systems without modifying the DBMS structure.

The benefits of using an XML-based application server to move towards interoperability include:

- Reduction in Web site development and maintenance costs, thus freeing monies and providing more flexibility in making funding choices for other programs.

- Incorporation of a Model, View, Controller (MVC) design approach. MVC approach to design provides a clean separation between different components (logic, presentation, and data) of information and the programming functionality.
• More timely and efficient integration of arbitrary legacy systems and data sources into an existing network.

• Ability to easily add new systems to a network without impacting existing systems in the network.

• A framework for distributing and 3D simulations utilizing X3D and VRML.

• A revolutionary and synergistic effect on how our systems and warfighters communicate and share information.

E. METHODOLOGY

This research start with a thorough review of various established Web frameworks, application servers, XML parsing methods, and tools needed to help in the integration of XML in an application server processes. This establishes the background for the selection of the framework adopted in this thesis. The next phase of this research examines the current XML representation of the VRML in the context of 3D simulations and suggests modifications to support a Web application framework. This leads to a specification of requirements which form the foundation for building a functional prototype of the XML Web application framework to support Web based XML operations. The final step is evaluations of the Web framework prototype performance against traditional non-XML-Based Web site performance using Java Servlet technology with out XML.

F. SCOPE

Because the XML-based Web Publishing Framework can support an unlimited amount of Web applications services, all of the constraints below are imposed to limit the scope of this thesis to demonstrating an effective proof of principle:

• Extensible Markup Language (XML) is used as the interoperability language for data integration. Chapter 3 is will cover the merits of XML.
• Open source software development is used exclusively in order to reduce development costs of the Web framework.
• The Web-publishing framework uses Java Technology and supports the Java 2 Enterprise Edition (J2EE).
• Java is not only the best language for integration with XML, but it is also the foundation for most of the open-source XML, Servlets, editors, parsers, validators, and tools. This wealth of open-source material significantly expedited the building of the prototype.

G. CHAPTER OUTLINE

This chapter analyzes the problems and discusses the motivation behind the effort, namely:

• Present a brief background of the problem
• Discuss the problem targeted by Web framework.
• Ascertai the root causes of the problem.
• Define the methodology.
• In addition, recognize the constraints imposed on the solution.

Chapter II details the selection of an XML based Web framework, which provides the architectural components of the application server. The chapter covers the challenges of building a flexible, extensible, and scaleable system that allows efficient data integration and semantic interoperability.

Chapter III contains a review of techniques and technologies proposed to implement the Web framework. Along with the advantages and disadvantages of various state-of-the-art technologies are detailed and commercially available tools.

Chapter IV applies XML and Java related technologies to connect to heterogeneous database for analysis.

Chapter V automates the development of XSL stylesheets to enable translations between XML and 3D system object representations.

Chapter VI provides concluding remarks about the current system state. In addition, this chapter will review potential work for further research.
II. WEB PUBLISHING FRAMEWORKS

A. INTRODUCTION

This chapter describes the most significant applications of XML. While there are literally hundreds, and soon to be, thousands of important applications of XML, the topics in this chapter have a significant potential to change the way traditional Web site development processes occur. Using XML for presentation styling is very important, however XML data portability is the major justification for an XML-based application server. XML provides the format for the exchange of information between heterogeneous systems and a means of providing interoperability within DoD. The Web-publishing framework separates the presentation from content and thus facilitates the exchange of data between heterogeneous systems. This thesis supports a framework, which allows for the connection and conversion of a non-XML legacy system to an XML-based system. The framework also allows for the conversion of XML data into a wide spectrum of different presentations.

B. OVERVIEW

The US military is moving closer to a completely Web-based front-end for imbedded systems used to support interoperability. The United States Message Text Format (USMTF) has long been the tactical messaging tool of choice for the Department of Defense. As the Extensible Markup Language (XML) continues to proliferate and gain momentum in the commercial sector, many of its proponents have questioned the usefulness of the USMTF system. An Extensible Markup Language Message Text Format (XML-MTF) Development Team is converting the USMTF format to an XML-MTF format. While work is ongoing, tools are now available to take a common USMTF message and convert it into XML-MTF messages.

At the same time, the military needs more functionality, and interoperability between forces. The result has been the rise of the Web framework, which can support common data exchange and a separation between presentation and software coding using the MVC approach. As this framework is deployed, the new role of presentation is
different from the Webmaster, in that little or no Common Gateway Interface (CGI) script, Active server Pages (ASP), JavaScript, or other scripting language code are part of the job description. Instead, the Web presentation may focus solely on the Web site’s presentation, comprised of HTML and Format Object (FO) creation, modification, and development. The rapid changes in the military environment may require a complete application or site overhaul, which, in turn, may include changing hundreds of HTML pages to support joint operations. While Cascading Style Sheets (CSS) have improved, the difficulty of maintaining consistency across these pages requires a huge amount of time. Currently, even if this less than ideal situation were acceptable, software developers in DoD are a sparse commodity, and spending long periods of time making markup language changes to Web pages is an inefficient allocation of resources. This process may also lead to large time delays in page updates or Web site version changes. The bottom line is that Web sites need to be more flexible than they currently are.

With the advent of server-side Java, the problem has only grown. Servlet developers find themselves spending long hours modifying system.out.println() statements to output HTML, which in turn may require the software developer to modify Java code (Figure II.). The entire Java Server Pages (JSP) specification arguably stemmed from this situation; however, JSP is not a solution, as it only shifts the frustration to the HTML developer, who constantly has to avoid making incidental changes to embedded Java code. In addition, JSP does not provide the clean separation between content and presentation that it promises. What is required is a means to generate pure data content, and have that content uniformly styled either at predetermined times (static content generation), or dynamically at runtime (dynamic content generation).

The XSL and XSL Transformations (XSLT) technology space will improve the transformation of data. The problem, which remains, is that an engine must exist to handle content generation, particularly in the dynamic sense. Having hundreds of XML documents on a site has little benefit if there is no mechanism to apply transformations to them when requested. An additional requirement is for Servlets and other server-side components to output XML that should be consistently styled. This defines the requirements for the Web-publishing framework, which will be described in this chapter.
This Web-publishing framework attempts to address the complicated issues raised above. Just as a Web server is responsible for responding to a Uniform Resource Locator (URL) request for a file, a Web-publishing framework is responsible for responding to a similar request; however, instead of responding with a file, it often will respond with a published version of an XML file. A XML file is transformed using XSLT stylesheet; the document is processed within the application level, or converted into another format such as a VRML or Portable Document Format (PDF) output file. The requestor does not see the raw data that may underlie the published results, but also does not have to explicitly request which publication occurs. Often, a Uniform Resource Indicator (URI) base (such as http://www.xmlking.com/cocoon) signifies that a publishing engine that sits on top of the Web server should handle requests. The concepts are much simpler to describe than to implement within a framework, and finding the correct framework for Web site development is a nontrivial task.

C. SELECTING A FRAMEWORK

The available publishing frameworks, which support the requirements, are limited (see Appendix A). One of the best resources currently available products is XML Software’s list at http://xmlsoftware.com/publishing/. An evaluation of stable frameworks (see Appendix A reduces the list substantially). [XmlSof01] Appendix A provides a break down of systems to consider in the selection of the Web publishing frameworks.

1. Product Stability

Most of the sites listed in Appendix A are still in the early development phase. In fact, only fifteen systems are available which support a second-generation framework. While a higher version number is not a guarantee of stability, it often reflects the amount of time, effort, and review that a framework has undergone. The XML publishing
systems are a new beast resulting in the market being flooded with version 1.0 and 1.1 products that simply are not stable enough for research at this time.

Our criteria for selecting framework tools are provided below. If the framework tools do not offer Simple API for XML (SAX) 2.0 and Document Object Model (DOM) Level 2 support, or the product is a version 1.0 and 1.1 products or beta product, the product was not considered as a possible framework for this research. Also not considered were platform-specific technology and proprietary systems. These frameworks do not provide heterogeneous solution for easy of use and portability across multiple platform. Frameworks under consideration supported heterogeneous deployment across multiple platforms and did not lock DoD into a specific platform and/or operating system (such as Windows only). The goal of this thesis was to find a framework, which served clients on any platform and not to add a new stovepipe to the current Navy arsenal of legacy problems.

2. XML Tools and API Support

Stable frameworks, which were identified, supported a variety of XML parsers and processors. Frameworks using a platform specific parser or processor are the XML equivalent of a Windows only system. Although frameworks often integrate well with a particular parser vendor determining, a parser’s interchangeability is important to support multiple types of XML documents[Hun00].

Support for SAX and DOM is an important indication of the framework's longevity. Other frameworks for consideration were those whose developers were monitoring and incorporating the specifications of XML Schema, Xlink, XPointer, and other emerging XML technologies. The framework revisions often indicated added support for these XML specifications.

3. Heterogeneous Environments

The Web framework uses XML as the interoperability language for data integration. The use of Java’s Web technologies is not only the best language for
integration with XML, but also the foundation for most of the open-source XML, Servlets, editors, parsers, validators, and tools. Java tackles many of the heterogeneous environment problems. Java supports applications in a heterogeneous environment, which requires that applications be capable of executing on a variety of hardware architectures and operating systems. This is achieved by generating an intermediate code called byte code, which has an architecturally neutral format designed to be transported easily to multiple hardware and software platforms. Such a design can relieve both the developer and user of concerns related to heterogeneity of the target platforms. In addition, another attractive feature of Java is the notion of downloaded executable content (data that contain programs that are executed upon receipt). Such designs will avoid the software distribution problem and add new capabilities to the system implemented in a new Java class. [DIAWS01] Java provides unlimited possibilities to enhance the function of the Web-publishing framework of the future.

4. Market Presence

The last, and perhaps most important, question answered was determining if a Web publishing framework is used in production applications. Frameworks which lacked vendor reference applications or site locations were not considered. Vendors and developers should be able to support implementation of the products and proud to display their frameworks in action.[Hun00] We interpreted hesitance in this area as a sign that the framework was not ready for the production environment.

5. Making the Decision

After examining several selections, only a few sites, exhibited stable, heterogeneous, integration with multiple XML Tools and API, and provided support in a production environment. As of the date of this research (November 2001), less then ten publishing frameworks existed that support the latest version of SAX (version 2.0), DOM (Level 2), and Java API for XML Processing (JAXP) (Version 1.1), which are in production and have at least three significant revisions of code under their belts in
development. This will undoubtedly change over time as Web publishing frameworks evolve.

<table>
<thead>
<tr>
<th>Cocoon</th>
<th>Good</th>
</tr>
</thead>
<tbody>
<tr>
<td>Version: 2.0 release candidate 1</td>
<td></td>
</tr>
<tr>
<td>Developer: Apache Software Foundation</td>
<td></td>
</tr>
<tr>
<td>License: Open source</td>
<td></td>
</tr>
<tr>
<td>Platforms: Java</td>
<td></td>
</tr>
<tr>
<td>DOM 2.0</td>
<td></td>
</tr>
<tr>
<td>Multiple Parser</td>
<td></td>
</tr>
<tr>
<td>Supports July XSL draft</td>
<td></td>
</tr>
<tr>
<td>SAX 2.0</td>
<td></td>
</tr>
<tr>
<td>JAXP 1.1</td>
<td></td>
</tr>
</tbody>
</table>

Publishing framework HTTP Servlet that supports the use of DOM, XML, and XSL to provide Web content. The content is created in XML conform a DTD. Cocoon can then process the XML and apply an XSL stylesheet to it for rendering (different stylesheets for different browsers can be used. You can use Cocoon, for example, to create well-formed HTML pages from an XML source. Includes a SAX API and XSLT stylesheet compilation.

Table II.1 Cocoon Web Publishing Framework

Of these initial candidates however, Apache Cocoon Web Publishing Framework (Table II.1) was the only one which has demonstrated consistent success within the Java and XML community. Cocoon is an XML Application Server-based program which allows any conformant parser to be used, and is based on the Java Servlet technology. The system also is part of the Apache XML project, and has default support for Apache Xerces and Apache XALAN. It allows any conformant XML parser to be used, and is based on the Java Servlet architecture. In addition, there are several production sites using Apache Cocoon (in its 1.8 form). For these reasons, we have selected Cocoon as our underlying framework[Hun00].
D. OBJECTS

Cocoon is a publishing framework designed using Java. Cocoon publishing framework uses W3C technologies such as DOM, XML, and XSL to provide Web content. The Cocoon supports document content, style, and logic created by different system, individuals, or working groups. Cocoon’s layered framework provides for independent designs, reducing time and management overhead, and increasing work reuse.

Cocoon separates different XML files, and uses XSL transformation capabilities to merge them into a presentation or a new XML output. Cocoon provides the user with different ways of working, allowing independent content, logic, and style processes [Axm01].

E. INTEROPERABILITY

Cocoon Web publishing framework will support the Navy’s XML infrastructure and provide “Web Enablement” application services. The implementation of interoperable Web technologies across the Naval infrastructure allows subscribers and publishers of information to pull or push information “services” as required to performed operational or business transactions. [WEN01] Open source code is available for Cocoon Web Publishing Framework. The Web-publishing framework can provide information and Web transaction to multiple databases either XML based or not. Chapter IV will demonstrate some of the connection methods and technologies. Further, this research provides a mechanism for interoperability with joint/coalition forces and a means of conducting business with external agencies.

This research demonstrates the design and implementation of a Web-publishing framework, which exploits the advantages of Java to construct the framework, and which provides the solution for the automation of many tasks. The system also provides excellent high availability features, including automatic detection of failures, and alerts in the form of log files. In addition, the Java approach enables the building of a high performance server using a variety of hardware and software components.
F. MODEL

This Web publishing framework provides a means for resolving these differences in interoperability and representation with a simple, yet powerful, model as seen in figure II.1. The Cocoon model allows Web sites to be highly structured and well designed, reducing duplication efforts and site management costs by allowing different presentations of the same data depending on the requesting client (HTML clients, PDF clients, Wireless Markup Language (WML) clients, X3D Simulation clients), and by separating according to different contexts requirements, skills and capacities. Cocoon enables better human resource management by reducing to a minimum the cross talks between different working contexts.

Figure II.1 Cocoon Web Publishing Framework
To do this, the Framework model divides the development of Web content into three separate levels:

- **XML creation** - the content owners create the XML file. They do not require specific knowledge on how the XML content is further processed rather than the particular chosen DTD/namespace.
- **XML processing** - the requested XML file is processed and the logic contained in its logicsheet is applied. XML separates logic from the content file unlike other dynamic content generators.
- **XSL rendering** - the created document is then rendered by applying an XSL stylesheet to it and formatting it to the specified resource type (HTML, PDF, VRML, XML, WML, XHTML)

The Web-publishing framework concentrates on solving the XML publishing infrastructure problem. In that respect, it is ahead of many of the vendors who worry primarily about the technology needed and less about how it integrates into an XML-based infrastructure. [Axm01]

**G. CONSTRUCTION OF A WEB PUBLISHING FRAMEWORK**

Enabling the sharing of information has the potential for significantly enhancing the capability of the XML based Web-publishing framework compared with individual components. The introduced framework enables information sharing among autonomously developed heterogeneous systems. Appendix B is an Installation guide for the Cocoon Web Publishing Framework on Window 2000. Construction of this Web framework affords the following benefits:

- The ability to discover the information and operations shared between server components.
- Assistance in identifying the different representations used for such information and operations by component systems.
- Definition of the transformations required to translate between different representations.
- CGI Scripting using Apache and generation of system-specific information used to resolve representational differences between component systems.
- Heterogeneous connections between multiple RDBMS Java Database Connection (JDBC): Object Database Connection (ODBC) bridges.
- Identification of the capabilities which support the WEN using the Navy XML Infrastructure as in the Web-publishing framework.
• Automation of the development of XSL stylesheets to enable translations between X3D and VRML system object representations

XML Based Web-Publishing Framework

Figure II.2 Cocoon Web Publishing Framework

1. Apache Web Server

The first task in constructing Web framework in Figure II.2 is to setup and load the Apache Web Server. Apache is a Hyper Text Transfer Protocol (HTTP) server, originally designed for Unix systems. Apache recently extended its Web server to support Microsoft Windows 2000 operating system[Ahttp01].

Apache uses the C++ program language to program the Apache Web server. Apache is also open source Web server and provides both source code and executable files for listed operating system. Apache provides the following desirable features:
• **HTTP/1.1 Compliance**

Aside from the optional proxy module (which operates as HTTP/1.0), Apache is conditionally compliant with the HTTP/1.1 proposed standard, as approved by the Internet Engineering Steering Group (IESG) and the Internet Engineering Task Force (IETF) HTTP working group. HTTP/1.1 provides an improved protocol, and allows greater performance and efficiency when transferring files. Apache still works well with HTTP/1.0 browsers.

• **Extended Server Side Includes (XSSI)**

A new set of server-side include directives allows the user to create better World Wide Web (WWW) pages. This includes a number of powerful new features, such as the ability to set variables and use conditional HTML.

• **File-Based And REGEX-ENABLED Directive Sections**

The new <Files> section allows directives to be enabled based on full filename, not just directory and URL. In addition, <Files> sections can appear in htaccess files. <Files>, along with <Directory> and <Location>, can now be based on regular expressions, not just simple prefix matching.

• **Browser-Based Environment Variables**

Environment variables can now be set based on the User-Agent string of the browser. Combined with XSSI, this allows the user to write browser-based conditional HTML documents.

• **SETUID CGI Execution**

Apache supports the execution of CGI scripts as users other than the server user. Apache has built in security checks to provide a safe environment.

• **URL Rewriting Module**

The optional mod_rewrite module is included. The module can provide powerful URL mapping, using regular expressions. Apache provides many advanced features.
• **Enhanced, Configurable Logging**  
The optional mod_log_config is included with Apache and is enhanced to allow logging of detail about the transaction, and can be used to open more than one log file at once (each of which can have a different log format). Apache can write any logs to a directory, which is writable by anyone other than the user that starts the server.

• **User Tracking (Cookies) Revisions**  
Apache supports the use of cookies directly. The mod_usertrack provides the user with the ability to disable the generation of cookies and can disable pre-compiled cookie modules. In addition, an expiration time can be set on the cookies.

• **Virtual Host**  
The Virtual Host directive works with more than one IP address or hostname. This lets a single vhost handle requests for multiple IPs or hostnames. In addition, the special section `<VirtualHost _default_>` provides request handling.

• **CGI Debugging Environment**  
Script Log allows the user to set up a log that records all input and output to failed CGI scripts. This includes environment variables, input headers, POST data, output, and more. This makes CGI scripts much easier to debug.

• **Resource Limits For CGI Scripts**  
New directives allow the limiting of resources used by CGI scripts (e.g., max Central Processing Unit (CPU) time). This is helpful in preventing 'runaway' CGI processes.

• **Redirect Directive Can Return Alternate Status**  
The Redirect directive can return permanent or temporary redirects, "Gone" or "See Other" HTTP status. Apache also implements National Center for Supercomputing Applications (NCSA) -compatibility, RedirectTemp and RedirectPermanent.

• **Add Or Remove Options**  
The Options directive can now add or remove options from those currently in force, rather than always replacing them.

• **Command-Line Help**  
The -h command-line option now lists all the available directives.
• **Optional Headers Module To Set Or Remove HTTP Headers**

The optional mod_headers module can be used to set custom headers in the HTTP response. Apache can append to existing headers, replace them, or remove headers from the response.

• **NCSA Satisfy Authentication**

The National Center for Supercomputing Applications, one of the five original centers in the National Science Foundation's Supercomputer Centers Program and a unit of the University of Illinois at Urbana-Champaign. NCSA greatly broadened the user base of remote supercomputing and the Internet with NCSA Telnet in 1987. In 1992, the center introduced NCSA Mosaic, the first readily-available graphical Web browser.[NCSA] Apache server supports directive implemented satisfy NCSA authentication and allows for more flexible access control configurations.

• **NCSA Compatibility**

Apache directives are more compatible with NCSA 1.5 to make moving between servers easier. In particular, Apache implements the Satisfy, MaxKeepAliveRequests, Redirect Permanent and RedirectTemp, directives, and the following directives are now syntax-compatible with NCSA: AuthUserFile, AuthGroupFile, AuthDigestFile, KeepAlive and KeepAliveTimeout.

• **Optional proxy module**

An improved File Transfer Protocol (FTP), HTTP, and CONNECT mode Secure Socket Layer (SSL) proxy is included.

2. **Tomcat Servlet Engine**

The next step in constructing the Web framework is to install the Jakarta-Tomcat Servlet Engine after the Apache Web Server. Tomcat Servlets on the server side are analogous to applets on the client side. The Web server executes Servlets inside the Java Virtual Machine (JVM). Figure II.3 shows the Servlet engine and Web server relationship. Major Web servers, including the Netscape Web server, Microsoft’s Internet Information Server (IIS), the W3C Jigsaw Web server, and Apache Web Server incorporate Servlets technology[Tom01].

21
Java Servlets

Servlets are Java Technology’s answer to CGI programming. Servlets are Java programs that run on a Web server, acting as a middle layer between a request coming from a Web browser or other HTTP client and database or applications on the HTTP server. Java programs offer a proven structured programming and object-oriented programming (OOP) environment [Dietel]. The Tomcat Servlet Engine uses the Java programming language to program the Servlet engine. Tomcat is also an open source Servlet engine and provides both source code and binary files which can be used in any operating system containing a JVM. The Tomcat Servlet Engine using Servlets executes the following steps [Tom01].

- Read data sent by the user. Servlets are invoked and executed on the server. The data is usually entered in a form on a Web page, Java applet, Java Servlet, or a custom HTTP client program.
• Servlets receive a request from the client and look up any other information embedded in the HTTP request. This information includes details about browser capabilities, cookies, the host name of the requesting client, and so forth.
• Generate the results. This process may require talking to a database, executing a Remote Method Invocation (RMI) or COBRA call, invoking a legacy application, or computing the response directly.
• Format the results inside a document.
• Set the appropriate HTTP response parameters, telling the browser what type of document is being returned, setting cookies, caching parameter and other such tasks.
• Servlets are very powerful and written by software developers. Servlets provide for structured programming using an object-oriented language.

3. **Cocoon Publishing Framework**

Cocoon is a Java publishing framework that relies on new W3C technologies (such as XML and XSL) to provide Web content. Cocoon is also open source publishing framework and provides both source code and binary files capable of operating with any operating system, which has a JVM. The Cocoon processing model in figure II.4 provides the separation of:

- Production - where XML content is generated based on Request parameters (Servlet equivalent)
- Processing - where the produced XML content is transformed/evaluated
- Formatting - where the XML content is finally formatted into the desired output format for client use.

![Cocoon Processing Model](image)

**Figure II.4** Cocoon processing model
This separation of working contexts allows Cocoon users to implement their own internal modules to add the functionality require to tailor a publishing system. Cocoon distribution includes a number of processors that implement common needs and situations. These are:

- **XSLT processor** - Applies XSLT transformations to the input document. XSLT allows you to solve your transformation needs as well as simple tag evaluation/processing due to its extensible and programmable nature. XSLT is a W3C Recommendation.

- **Extensible Server Pages (XSP) processor** - Evaluates XSP pages and compiles them into producers. This processor allows you to include programmatic logic into your pages as well as to separate the logic from the content. Note that the XSP Processor assumes that it is getting its input from a static file, so it will not work well with pre-processing. Its design indicates that it should really have been a Producer in the first place, instead of a Processor. XSP also evaluates XML processing instructions with multi-language (Java and EcmaScript) logic. This processor allows you to do programmatic substitution and inclusion eliminating the need for complex processing logic.

- **Extensible Standard Query Language (ESQL) processor** - Evaluates simple tags describing ESQL queries to JDBC drivers and formats their result-set in XML depending on given parameters. Extended SQL taglib allows easy post-processing of output within XSP.

- **ESQL logicsheet** is an XSP logicsheet that performs SQL queries and serializes their results as XML. This allows the user to work with data from a wide variety of different sources when using Cocoon.

- **Lightweight Directory Access Protocol processor** - Lightweight Directory Access Protocol (LDAP) provides access to the X.500 Directory while not incurring the resource requirements of the Directory Access Protocol (DAP). This protocol is specifically targeted at simple management applications and browser applications that provide simple read/write interactive access to the X.500 Directory, and is intended to be
a complement to the DAP itself. Key aspects of LDAP are protocol elements carried directly over TCP or other transport bypassing much of the session/presentation overhead. The LDAP processor evaluates simple tags describing LDAP queries to directory services, and formats their result-sets in XML depending upon given parameters. LDAP Processor is a processor for Cocoon that performs LDAP queries, translates the result set into an XML fragment, and inserts the fragment in the original document.

This research has presented the design and implementation of an XML based Web-publishing framework. In the next chapter, we will describe XML and JAVA technologies to leverage the advantages of an XML-based system.
III. TECHNOLOGICAL INTEROPERABILITY ENABLERS

A. INTRODUCTION

This chapter discusses the technologies implemented in the Cocoon Web Publishing Framework. Each discussion focuses on a description of the technology, implementations of that technology, and why the system uses that particular technology. There are three major factors that drove the design decisions for the implementing the XML-based publishing framework: DoD constraints, technology requirements for interoperability, and cost reduction.

1. Directives

The DoD is counting on XML and XML-related technologies to enable information dissemination management capabilities and to solve many interoperability issues. DoD Directive 8320.1, DoD Data Administration [DoD91], authorizes the establishment of, and assigns responsibilities for, DoD data administration to plan, manage, and regulate data within the Department of Defense. The Defense Information Systems Agency (DISA) is the lead agency responsible for executing the policy and procedures and making DoD Data Standards available to the community. DISA is using XML as its common exchange data format in support of its Defense Information Infrastructure Common Operating Environment (DII COE) data engineering strategy. The bottom line is that Navy XML Infrastructure (NXI) provides information exchange between the United States Navy and DoD systems.

2. Web Frameworks Technology Needs

The Web Frameworks need to support many different types of technologies, including XHTML, VRML, DHTML, JSP, XSP, JAVA, SERVLET, and XML. XML and its related technologies are not sufficient as stand alone systems. Java with its strong typing, properties, methods, interface inheritance, behavior inheritance, polymorphism, reflection, and its compatibility with XML, made its use essential. In addition, XML
technologies like DTD and XSLT are compatible within an XML based Web Publishing Framework.

3. Cost Reduction

Reducing the cost of doing business is one of the major benefits of this project. In this vein, the Cocoon Web Publishing Framework reduces the cost of actually building the system itself. The biggest reduction results from the liberal reuse of open-source software. Open-source software reduces costs in four ways:

1. It is free!
2. The world can read, modify, and even redistribute this type of software. This allows users to leverage and build on the work of others. This reduces the cost of labor in the software development.
3. Because of the second point the system is assured that the software incorporated will continue to evolve while at the same time exposing the code to testing by the masses. Again, this is a savings in labor with regard to testing and maintenance.
4. The life cycle for this type of software is extremely compressed, i.e., better software faster, when compared with proprietary software. This is possible because many companies and individuals are all able to contribute to the development of software.

B. XML THE NEW LINGUA-FRANCA

XML stands for Extensible Markup Language, which is a meta-markup language that became a World Wide Web Consortium (W3C) recommendation in January 1999. It is a new language for structured documents and data on the Internet. XML is platform-independent, non-proprietary, customizable, self-describing and human readable. This chapter assumes the reader has passing familiarity with this topic and will not provide an in-depth discussion on XML[Chri01]. See [W3C] for more detailed information.

XML is a family of technologies. This research will focus on a few members of this family, namely XML, DTD, XML Schema, SAX, DOM, XSLT and XHTML.

1. XML basics

The best way to get a feel for XML is by viewing an example. Figure III.1 below shows a simple XML document.
XML looks similar to HTML. The major difference is that XML is a meta-language that offers no inherent clue as to how the information should look. This frees XML from the static tag set of HTML and separates the model created from its view. All XML documents are properly nested (hierarchical) tree structures. This example document contains a root element </>, which contains one child element <pages>, which, in turn, contains two child elements called <title> and <content>. Notice that the XML document nicely describes the structure of the data.

2. **Well-formedness**

A document is not an XML document unless it is well formed, i.e., syntactically corrects, according to the W3C’s XML specification. Ill-formed documents are not accepted for processing. This simplifies the internal code of parsers and speeds up the processing of documents.

3. **Validity**

An XML document is valid if it has an associated schema, DTD or XML Schema, and if the document complies with that schema. A schema further constrains the syntax.
of the XML document and adds semantics through documentation within the schema itself.

C. CONSTRAINING CONTENT

1. DTD

A Document Type Definition (DTD) specifies the logical structure of the document; it is a formal grammar describing document syntax and semantics. The purpose of a DTD is to define the legal building blocks of an XML document. It defines the document structure with a list of legal elements. A DTD can be declared inline in your XML document, or as an external reference. With DTD, each of your XML files can carry a description of its own format with it. With a DTD, independent groups of people can agree to use a common DTD for interchanging data. Applications can use a standard DTD to verify that the data receive from the outside world is valid. The user can also use a DTD to verify own data. This thesis does not discuss DTD in significant detail because the logical structure and designs of DTD used in the Web framework were already defined an incorporated. The DTD’s biggest flaw is that it has no capability for strong typing. DTDs treat almost all of its data as simply strings[Chri01].

2. XML Schema

An XML Schema formally specifies a coherent set of definitions for elements and attributes. Within the schema definition are declarations of which elements, attributes etc. are legal within a document, and the locations where they are legal. [Gold01] In other words, the schema specifies the content and structure of an XML document. Figure III.2 show a simple yet powerful example of a XML schema. If a document does not conform to the XML schema specification, it is not valid.
The XML Schema is a W3C recommendation that improves the deficiencies of the Document Type Definition (DTD). DTDs also specify the content and structure of an XML document, but DTD document schemas are not written in XML and only support character data. XML schemas make up for these deficiencies while providing new capabilities that make it more robust and powerful than a DTD. Some of the extensive additional capabilities that schemas as seen in figure III.3 provide include:

- New built-in data types such as integers and dates;
- User-defined data types that can be created to put additional constraints on built-in data types;
- Any non-negative whole number can be used to specify the number of child element occurrences (formerly just zero, one, and infinity were allowed);
- Schema constructs can be imported from existing schemas;
- A process called refinement enables elements to inherit content and attributes from other elements. [Bird99]
Figure III.3  XML Schema

An XML Schema can specify actual data types for each element’s content within a document. In addition, XML Schemas have built in elements to handle annotations to add semantics to the types created. XML Schemas can handle multiple namespaces allowing a means to process multiple XML documents. A more detail discussion of XML Schema can be found at [W3C].
D. PROGRAMMATIC ACCESS

1. SAX

Simple API for XML (SAX) and DOM (Document Object Model) were both created to serve the same purpose of providing access and modification capability to the information stored in XML documents via any programming language. However, both of these techniques take very different approaches in providing that access.

SAX provides access to documents as a sequence of events. It works as follows:

- A SAX parser sequentially processes an XML document, signaling an event when a specified item such as an open tag or close tag is found.
- The programmer is responsible for interpreting these events by writing an XML document handler class. This handler class is responsible for specifying what actions are required when a tag is encountered, such as storing an element for future reference.

2. DOM

XML only supports “has a” or “parent-child” relationships, such as a <patient> may contain sub-elements of <first_name>, <middle_name>, <last_name>, <title>, <social_security_number>, etc in a hierarchical tree structure. The Document Object Model (DOM) preserves the hierarchical tree structure. DOM creates a tree of nodes based on the structure and information in an XML document, and provides access to this information by interacting with this tree of nodes. The DOM takes a generic approach, in that it will take any arbitrary XML document and model it. The DOM creates a document object tree (by the XML parser, or by internal coding). Using the interfaces for the DOM API, a developer can access elements in the tree, modifying, deleting, and creating leaves and branches.

3. SAX vs. DOM

The choice of SAX or DOM is depends upon how complex a document the programmer wishes to access, ease of use, and performance concerns. The SAX treats a document as a series of events, which means it efficiently and swiftly analyzes large XML documents. The drawback is that the developer has to define the data structure to the hold element data. The DOM must load the entire document in-memory before
granting access. This takes more memory and time compared to SAX. The DOM’s primary advantage is that the parser does almost everything, including reading the XML document in, creating a Java object model on top of it, and then giving a reference to this object model (a Document object) for manipulation. Within the Web framework, speed and memory are critical issues so the SAX will usually perform better, however DOM’s ease of use makes it preferable when development time is a major issue[Chri01].

E. TRANSLATIONS EXTENSIBLE STYLES LANGUAGE (XSL)

The Extensible Stylesheet Language (XSL) is a W3C specification for applying standard formatting to XML documents. It consists of two standards: format and transformation. The formatting standard defines the semantics of formatting in the form of a catalog of formatting objects. The transformation standard has evolved into a language that is autonomously useful for transforming one XML document to another. It is known as Extensible Stylesheet Language for Transformations (XSLT). XSL is the link between abstract data required for computer processing and the formatted rendition essential for human readability. XSLT transforms a document from an abstraction to a rendition. (Goldfarb, 2001) By using multiple XSL stylesheets, a single message can be formatted for text, XHTML, printing, or e-mail.

Extensible Styles Language (XSL) is essentially three languages: a transformation language (XSLT), an accessing language (XPath), and Extensible Markup Language Formatting Object (XML-FO).
XSLT is a high-level, declarative, and XML-based language. It allows a programmer to write XSLT code (style sheets) that transforms an XML document into any text-based document. Figure III.4 is a simple Example XSLT style sheet and Figure III.5 is the associated browser display.
XSLT behaves as follows:

- An XSL engine converts the XML document into a tree structure, composed of various types of nodes.
- A style sheet transforms the XML document using pattern matching, via XPath language notation, and then applying rules (templates) within the style sheet.
- In the transformed document, the body of the template element replaces the matched node in the source document.

XSLT has a very neat capability to do functional transformations by escaping into another language using Extensible Markup Language Formatting Object (XML-FO). The W3C’s XSLT recommendation does not define any aspect of this mechanism nor does it require that an XSLT processor should provide one at all. Future versions of XSLT should remedy this. XML-FO used in the Cocoon Web Publishing Framework provides the following features for XSL-FO:

- Specifications transformed into Portable Document Format (PDF) allowing for an easy integration when rendering PDF documents.
• Specifications generate a Scalable Vector Graphics (SVG) image out of a dynamically generated page. Database graphs and vector counters are also used in Cocoon.
• Specifications when mixed with other graphic outline specification such as SVG and PDF. Both are interpreted by Formatted Object Protocol (FOP) and rendered into PDF as area and vector graphics.
• Generation of VRML by applying the appropriate stylesheet using XML-FO.
• Dynamic ability to understand which browser is requesting the page and applies a different stylesheet to the same XML page to render in different client formats (e.g., Wireless Markup Language (WML), Wireless Access Protocol (WAP), browser/cell-phone, Personal Digital Assistant (PDA)).

Further discussion on extension functions can be found in [Kay00].

F. EXTENSIBLE HYPERTEXT MARK LANGUAGE (XHTML)

XHTML is a combination of HTML and XML (eXtensible Markup Language). XHTML consists of all the elements in HTML 4.01 combined with the syntax of XML. The Web has reached a point where many pages on the WWW contain "bad" HTML (Figure III.6).

The following HTML code will work fine if you view it in a browser, even however does not follow the HTML specification and trying to extract data required error correcting code.

```
<html>
<head>
<title>This is bad HTML</title>
<body>
<h1>Bad HTML</h1>
</body>
</html>
```

Figure III.6 Example of bad HTML

37
XML is a markup language where everything has to be marked up correctly, which results in "well-formed" documents. XML was designed to describe data and HTML was designed to display data. The WEN will consist of different browser technologies, some browsers run internet on computers, and some browsers run internet on mobile phones and palm pilots. The last-mentioned do not have the resources or power to interpret a "bad" markup language.

Therefore by combining HTML and XML, and their strengths, W3C produced a markup language that is useful now and in the future. XHTML pages can be read by all XML enabled devices and while waiting for the rest of the world to upgrade to XML supported browsers, XHTML gives you the opportunity to write "well-formed" documents now, that work in all browsers and that are backward browser compatible. XHTML is XML; an XHTML (XML document) is validated against a either a DTD or a XML Schema. The output is parsed against the XHTML XSL stylesheet.

Figure III.7 HTML to XHTML Conversion
The framework prototype site uses XHTML in the Web site is design (Figure III.7). All HTML files are converted into an XML document. A DTD (Appendix C Section E) validates the XML files and applies an XHTML stylesheet to create the output file of XHTML. Example of the conversion code is contained in (Appendix C). In the Web publishing framework prototype site, all Web pages are designed using FrontPage and converted to XHTML using HTML-Kit. HTML-Kit is free software available at http://www.chami.com/html-kit/. HTML-Kit validates the HTML and converts the HTML to a well-formed XML document. The HTML-Kit automatically assigns a DTD to validate the XML document, and applies an XHTML stylesheet to create XHTML.

G. XML COMPONENTS

While there are many components and rules for creating a proper XML document, only XML components incorporated in this thesis are discussed. There are countless numbers of XML books, Web pages, magazines, presentations, and other resources available for readers who desire more information on the subject. A good starting point is the World Wide Web Consortium (W3C) home page at http://www.w3.org.

Elements and attributes are the fundamental nodes used to create XML documents. Elements consist of a start and end tag, and are characteristically given descriptive names to denote meaning. In figure III.9 <SUBMARINE_OFFICER> LCDR Smart </SUBMARINE_OFFICER> is the element <SUBMARINE_OFFICER> containing the data “Sub Off: LCDR Smart”(Figure III.8). Tag names must begin with a letter, underscore, or colon. Follow on characters can be letters, numbers, etc., but cannot contain white space. As noted earlier, it is easy to depict the same data using name spaces. Because XML parsers are case sensitive, the element like <Engineering_Duty_Officer> is not the same as <engineering_duty_officer> or <ENGINEERING_DUTY_OFFICER>, but (to humans at least) all three versions clearly describe the same data.
CO: Capt Winitall
XO: CDR Captiwant
Repair Fac: LDCR Misslefix
Sub Off: LDCR Silence
Carrier Off: LCDR Cruiser
Sup Officer: LT Fast

Figure III.8  HTML Component Example

COMMANDING_OFFICER>Capt Winitall
EXECUTIVE_OFFICER>CDR Captiwant
REPAIR_FACILITIES_OFFICER>LDCR Misslefix
SUBMARINE_OFFICER>LCDR Smart
CARRIER_OFFICER>LCDR Cruiser
SUPPLY_OFFICER>LT Fast

Figure III.9  XML Component Example

Attributes enable an author to define extra information about an element. Values given to attributes are strings that must be delimited by quotation marks. An example of an attribute is <Service branch="USN"> where <Service> is the element with the
attribute branch having the value “USN”. There are arguments for and against the use of attributes. Arguments opposed to the use of attributes include the inability of attributes to specify structure, and their tendency to inhibit document readability when they are used in excess. Arguments in favor of using attributes included usefulness in describing the unique properties of an object and therefore increasing the quality of the metadata provided. In any case, a good rule of thumb is to use an attribute for simple, unstructured “secondary” information that is unique and cannot be separated from the concept of the element. [Nick01]

H. JAVA J2EE TECHNOLOGY

The Web-publishing framework uses Java Technology, which supports the Java 2 Enterprise Edition (J2EE). At the application layer, enterprise wide systems are recommended. Java 2 Enterprise Edition (J2EE) is the preferred distribution object model. J2EE is based upon open standards that promote common interfaces for object use, storage, and run-time interactions. [WEN01] J2EE provides the following capabilities:

- J2EE specifies architecture for developing and deploying distributed applications.
- J2EE promotes the 3-tier distributed software architecture.
- J2EE is built on a server-side component model.
- J2EE promotes the development of interoperable software components.
- J2EE provides the robust and reliable system-level services, which distributed applications, require, such as data access, transaction management, security, and client connectivity.

1. Java Servlet

Java Servlets are more efficient, easier to use, more powerful, more portable safe, and cheaper than traditional CGI and many alternative CGI-like technologies. Servlet technology is very general. The Servlet model is designed to be used over any protocol or with clients other than Web browsers. Currently, the Web-publishing framework uses the Servlet technology for Web applications. For this reason, we review only one special kind of Servlet: HTTP Servlets.
HTTP Servlets extend the HTTP Servlet class, which implements the Servlet interface. These Servlets provide more features than just fast response to clients. For instance, GET parameters that are passed through a Web browser to a Web server are available to the user of the Servlet API. Similarly, output sent from a program is sent back to the browser on the behalf by the Web server Servlet response. Two or more requests for the same Java class run in multiple threads (as opposed to multiple processes in the CGI model). This means that a Java class is thread safe.

Similarly, when requests for a Java class cease, the instance is not extinguished. Instead, in anticipation of future requests, the memory and other resources are reused when necessary. Of course, Java garbage collection takes place as usual.

An HTTP Servlet’s job is to read any data sent by the user usually via a Web page. The Servlet looks up information about the request that is embedded in the HTTP request such as cookies, host name, etc. and generates the results. Appendix D shows a simple example of Servlet and JSP technology.

2. Java Server Pages (JSP)

Java Server Pages (JSP) is similar to the dynamic part of Active Server Pages (ASP), except it is written in Java rather than VBScript or another ASP specific language, so it is more powerful and better suited to complex applications. JSP is portable to other operating systems and Web servers, and is a free, open source HTML-embedded scripting language.

JSP does not provide any capabilities that could not be accomplished with a Servlet. JSP are automatically translated into Servlets behind the scenes. JSP improves the dynamic HTML generation by separating the presentation from the content. The Web page design expert can build the HTML using familiar tools and leave places for programmers to insert the dynamic content.

Another reason to have multiple Servlets and/or JSPs communicating is to produce loosely coupled reusable Web components. The JSP example in Appendix D is an input form used to communicate between JSP and a Servlet.
3. Enterprise Java Beans (EJB)

EJBs are a high-level specification for a server side component model. EJBs are designed to run in distributed environments. The beans are built on top of the Remote Method Invocation (RMI), thus EJB support distributed computing. EJBs provide the following:

- Standard component model for distributed applications written in Java.
- An easy way of creating distributed applications by hiding low-level details such as location, transaction processing, object creation, and persistence.
- Platform independence running in any EJB container on any platform.
- Compatibility with existing application server’s platforms, and other Java API’s allowing vendors to include EJB functionality without disabling support for other technologies.
- Compatibility with COBRA.

An EJB container consists of an EJBHome, EJBOBJECT, and the EJB. The container serves the function of acting as a holder of EJBs. The container resides on the server. It provides security, transaction services, concurrency, data persistence, and other services completely transparent to the beans inside the container and to the users of the beans outside the container. The container contains multiple types of EJB’s each with an EJB home interface to allow interactions with the container and the clients. The client application “finds” the container by calling on the JAVA Naming and Directory Interfaces (JNDI) service. Essentially, it is a phonebook for distributed objects, providing information on how to connect to the bean. The EJB handles the establishment of communication between client and server. The client application gets a reference to an EJB through the home interface and communicates to the underlying bean through the EJB object stub class. EJB’s architecture provides multiple database connections and offer an easy way of creating a distributed application.

This research did not incorporate the EJB component, which the Web application framework is fully capable of supporting because the goals was to demonstrates and evaluates the functionality of an XML-based Web Publishing Framework. The Web framework prototype in chapter IV demonstrates ability to connect to RBDMS with
either a generic Servlet connection which converts non-XML data to XML format or a completely XML-base systems using the Web Publishing Framework to convert non-XML data to XML format. [CoreS].
IV. IMPLEMENTATION OF THE WEB APPLICATION Framework TO CONNECT TO HETEROGENEOUS DATABASES.

A. INTRODUCTION

US Navy needs to migrate from centralized database architecture to globally distributed replicated heterogeneous systems. One of the greatest challenges facing today’s US Navy is the integration of heterogeneous systems without compromising local autonomy, reliability, and transparency. The distributed database is growing in importance since the current client-server central architecture provides access to many databases. The US Navy needs to create a system by which uniform storage, access and retrieval is being made possible. Currently Web network services have independent processes for collecting, analyzing, and displaying data. There is no truly interaction or automatic information sharing the elements in the U.S. Navy network. This results in duplication of effort since some commands might collect and analyze the same information without realizing that similar information exists at other sites. Further, due to the independent nature of these sites, the Navy loses the benefit of accessing data on other sites.

A distributed database is single logical database that is spread physically across computers in multiple locations that are connected by a data communications link. Distributed Database system with multiple sites needs to maintain local autonomy to be able to support local DBMS and provide manageable the system by the Database Administrator (DBA). Local Autonomy provides the ability of systems interoperate across multiple operating systems. Autonomy is needed because each system may be specializing in an area and could treat some of the data as irrelevant to its audience.

Distributed DBMS must be able to maintain location transparency, replication transparency, and failure transparency. Location transparency allows users to make queries or update to database systems and not know the location of the data. It appears to the user as a logical database stored at one site. Replication transparency allows the users to access data and not to realize that the data is copy. Also, failure transparency this
hides transactions failures for the user. Transaction failures need to support a concurrency. Either all or none of the actions of a transaction is committed using concurrency control scheme to ensure data integrity. Distributed DBMS Transparency Objectives should incorporate a Commit Protocol: Ensures that a global transaction is either successfully completed at each site or else aborted and support asynchronous transactions. An XML-based Web Publishing Framework with the Java technologies provides solutions for distributive database architecture.

Additionally, this section will shows the prototypes generic XML access distribute database architecture and provide a prototype mechanism in figure IV.1 to share XML data across a network using the Web Publishing framework. This architecture uses a uniform environment, which allows for ad hoc networks. In this way, a user familiar to a site can access information from other sites. The design provides users the autonomy in the choosing the operating system, the storage medium, and the user interface[Will00].

There are a number of reasons why the Navy needs to expose the database information as XML listed below:

- Sharing data with other systems
- Interoperability with heterogeneous system
- Exposing legacy data to application that use XML
- Business to business transactions
- Object persistence using XML
- MVC design approach
- Content syndication
Figure IV.1  Generic Database Access Web Publishing Framework

The prototype demonstrates XML’s integration with RDBMS. The research shows how to store XML data in its native format and in a relation database, as well as how to create generic XML database access model using both Java Servlet technology and XML technology that allow quick and efficient access such as data driven Web pages. This section will examine an approach to taking existing relational database and moving it to a fully controlled XML format.

B.  ENVIRONMENT

XML provides the user the ability to represent structured data without any additional information. Because this structure is inherent in the XML document rather then needing to be driven by an additional document that describes how the structure appears, it becomes very easy to sent structured information between systems. Since
XML documents are simply text files, they may also be produced and consumed by legacy systems allowing these systems to expose their legacy data in a way that can easily be accessed by different consumers.

Another advantage to the use of XML is the ability to leverage tools, either already available, or starting to appear, that use XML to drive more sophisticated behavior. For example, XSLT may be used to style XML document producing XHTML documents, X3D, VRML, WML decks or any other type of text documents. XML Web publishing framework allows XML to be encapsulated in routing information, which then may be used to drive documents to the user in desired output.

The framework system implements Java because Java is portable across various operating systems and Storage devices. In addition, Java Servlets are tightly coupled with the Java Object Oriented language and J2EE. With the emergence of the XML as a common information medium, and given the issues of dependability and availability of the Internet, the need for asynchronous distributed transactions has escalated. Oracle is the predominant the database system. However, other relational databases such as SQL 2000, Access, Informix, and Sybase could also be connected using the Web-publishing framework and a JDBC. Similarly, UNIX and Windows are common operating system used in the Navy’s network. Thus, the prototype system uses technologies that interoperate across multiple operating systems. The system provides autonomy because XML enable the user at each node to treat some of the data as irrelevant to its audience.

The framework implements a nodal hierarchic structure using XML and JAVA that will provide a quick connection to databases. The structure concept of nodal encapsulates metadata using XML as a common reference.

C. FUNCTIONALITY XML BASED WEB FRAMEWORK

When you combine XML with J2EE technologies and standard Internet protocols used in the Web Publishing Framework the user can quickly develop enterprise applications that provide universal data access to JDBC data sources with a minimal amount of coding. With XML, XSLT, and JDBC the developer can design scalable and
extensible architectures that facilitate device independent data delivery in J2EE applications. This allows end user to access your data using Web browsers or any other current of future devices that render content using an XML based Markup Language. Combining XML, Java, and JDBC facilitated the creation of Web services using J2EE.

The JAVA Servlet and XML database connection in appendix F. uses JDBC Data Source and Driver. The JDBC Data Source and Driver support a variety of different relational database products. Most database products on the market today include a JDBC driver (Oracle, Microsoft SQL, MySQL and Microsoft Access). The fully implemented XML database connection in appendix G. uses JBDC connection within a XML Schema. XML Schema also provides a mechanism for capturing information used to establish correspondence between systems. The schema defines the structure, syntax, and to some extent, the semantics of the component system external interface.

D. EXAMPLE OF DATABASE CONNECTIVITY USING THE WEB FRAMEWORK WITH SERVLETS

This section discusses the JAVA Servlet and XML database generic connection architecture (Figure IV.2). The main control section for heterogeneous database access using JDBC is the class GenericXMLJdbcAccess. This class controls access to databases using Servlets, executes SQL statements using the JDBC data source, serializes the returned result set in XML format, and returns an XML document to the requestor. In the architecture, the GenericXMLJdbcAccess is reused by two Java Classes: JdbcXmlDB and JdbcXhtmlDB. The JdbcXmlDB provides a generic XML over HTTP interface to JDBC data source for XML-enabled applications. The JdbcXhtmlDB returns a result set as HTML over HTTP to the Web browser using the specified XSL stylesheet. The system in figure IV.2. essentially acts as a request controller for the database connection, which delegates handling to the JdbcXhtmlDB or JdbcXmlDB classes.
1. **GenericXMLJdbcAccess Class**

   The GenericXMLJdbcAccess class encapsulates the functionality required to query a database and return the results of the query to develop a well-formed XML document (see Appendix E, Section B for the associated source code). The encodeXML() method applies the XML encoding rules for generic data access. The method simply does a “search and replace” operation on the string into the method, replacing instances of special characters. The method will be used by writeXML() method to ensure that any data retrieved from the database is encoded properly before serialization to XML. The writeXML() method creates a DTD-less document, which is parsed by a non-validating XML parser, and returns serialized string into an XML document. The XML document contains the result set, that is metadata and data values, as seen in Appendix E, Section E. The execute() method does the following:
/**
 * Establish a connection to a database and executes the SQL Query returns String ResultSet
 * formatted in XML
 */

public String execute(String driver, String url, String uid, String pwd, String sql)
{
    String output = new String();
    try
    {
        Class.forName(driver);
        Connection conn = DriverManager.getConnection(url,.uid,pwd);
        Statement s = conn.createStatement();
        ResultSet rs= s.executeQuery(sql);
        output = writeXML(rs);
        rs.close();
        conn.close();
    }
    catch(Exception e)
    {
        output = "<error>" + encodeXML(e.toString()) + "</error>";
    }
    return output;
}

Figure IV.3  GenericXMLJdbcAccess.Class Execute() Method

- sql - This argument contains the complete text of an arbitrary SQL92 command.
- s.executeQuery - This triggers the execution of the SQL command.
- rs is the result- this event fires when the SQL command completes executing. It contains a numeric error code, or zero for success.
- Exception handles the errorMessage –This event fires when the SQL command completes execution. It contains a text error message, or an empty string for success.
- url, UID, PSD - This field references a database URL, user identification, and password that enables access to the database.
- writeXML(rs)- passes the result set to write for conversion, and creates the XML serialized output.
2. **JdbcXmlDB Class**

The JdbcXmlDB class provides an XML over HTTP interface to a JDBC database (see Appendix E, Section C for the associated source code). The Servlet implements the javax.Servlet.http.HttpServlet.class and JdbcXmlDB uses the doGet() and doPost() methods from the httpServlet.class. The doGet() method instantiates the GenericXMLjdbcAccess class and calls the execute() method. The doPost() method overrides the doGet() method by simplifying the call to doGet(). This method returns the XML serialized result set to respond to each HTTP request.

3. **JdbcXhtmlDB Class**

The JdbcXhtmlDB class provides an HTML over HTTP interface to a JDBC database (see Appendix E, Section D for the associated source code). The Servlet implanting the javax.Servlet.http.HttpServlet.class. This class also uses the doGet() and doPost() methods. The doGet() method instantiates the GenericXMLjdbcAccess class and calls the execute() method. The doPost() method overrides the doGet() method by simplifying the call to doGet(). The GenericXMLjdbcAccess returns the XML serialized result set document to this Servlet. The Servlet then makes a call to the DOM method (figure IV.5.) using “XSLTProcessor proc = XSLTProcessorFactory.getProcessor();” and the “proc.process(new XSLTInputSource(new java.io.StringReader(output)), new XSLTInputSource(xsltSystemId), new XSLTResultTarget(xmlout));” functions. The DOM parses the “output” result set XML document with the “xsltSystemID” XSL Stylesheet (Appendix E, Section F). This method returns an HTML serialized result set “xmlout” to respond to the HTTP request (figure IV.5.). Appendix E, Section I shows the HTML result from the JdbcXhtmlDB, which applies the JDBCHTML.xsl stylesheet.
```java
Public class JdbcXhtmlDB extends HttpServlet {

    public void doGet(HttpServletRequest req, HttpServletResponse res)
    throws IOException, ServletException {

        String qryPath;
        String xsltSystemId = new File("C:/jakarta-tomcat-3.2.3/Webapps/jdbcxml/WEB-INF/classes/jdbc/xml/JDBCHTML.xsl").toURL().toExternalForm();

        if(req.getPathInfo()==null) {
            qryPath = getServletConfig().getServletContext().getRealPath(req.getServletPath());
        }
        else {
            qryPath = req.getPathTranslated();
        }
        res.setContentType("text/html");
        PrintWriter xmlout = res.getWriter();
        GenericXMLJdbcAccess searchOBJ = new GenericXMLJdbcAccess();
        String output = searchOBJ.execute(req.getParameter("driver"),
            req.getParameter("jdbcurl"), req.getParameter("uid"),
            req.getParameter("pwd"),req.getParameter("sql"));

        try {
            XSLTProcessor proc = XSLTProcessorFactory.getProcessor();
            proc.process(new XSLTInputSource(new java.io.StringReader(output)),
                new XSLTInputSource(xsltSystemId), new XSLTResultTarget(xmlout));
        }
        catch(SAXException se) {
            throw new ServletException(se);
        }
    }
}
```

Figure IV.4  JdbcXhtmlDB.class doGet() Method
4. XHTML Interface Form

Figure IV.5. shows the XHTML interface form (see Appendix E, Section G for the associated XHTML code). The interface form was developed in HTML and converted into an XML document. A DTD validated the XML files and applied an XHTML stylesheet to create the output file of XHTML. The XHTML file uses user, database connection and an SQL query statement to call JdbcXhtmlDB. Appendix E, Section F shows the XHTML XML document.

![XHTML interface form](image)

E. EXAMPLE OF DATABASE CONNECTIVITY USING THE WEB FRAMEWORK WITH SERVLETS AND XML

The XML-Based Web Publishing Framework allows for database connection using ESQL (Figure IV.6). ESQL is a very new technology, evidenced by the sparse
amount of documentation currently available. This section documents a generic database connection using XML-based Web Publishing Framework. This design can support multiple queries to different databases. The connections and queries can be built in an XML document GenericESQL.XML (Figure IV.7 ). The XML document is validated against a schema using the ESQL.XSD document (Appendix F, Section B). The Schema is a formal specification, written in the W3C standard language XML Schema, of every single ESQL element and attribute. The documents are human readable and include comments for the documentation of each tag. The XML document is used by the framework to connect to the database using the JDBC:ODBC Bridge in the XML database generic connection architecture (Figure IV.6). The framework automatically responds to client base to XML document request by using the XML document extention and document name selected by the user("helloworld.xml").

Figure IV.6  XML database generic connection architecture
The GenericESQL.XML (Figure IV.7) document is requested by the client browser via a call to the XML document using the Web Publishing Framework URL and document name. The framework, in response to the users request, calls several processes using XSP and ESQL namespaces and converts the XML data using the GenericESQL.XSL stylesheet (Appendix F, Section C). The XML document is validated against the ESQL Schema (Appendix F Section B). The XML document is the main control section for heterogeneous database access using JDBC via the GenericESQL.XML (Figure IV.7). This document controls access to databases using XSP commands based upon the connection tag set. The document also executes SQL statements using the JDBC data source, serializes the returned results set in XML format, and returns an XML document to the requestor. The XML document also controls which output is applied. The output could be XML over HTTP to a JDBC data source for XML-enabled applications, or HTML over HTTP to a Web browser (Figure IV.8) using the specified XSL stylesheets with the document.

```xml
<?xml version="1.0"?>
<!-- edited with XML Spy v4.0 U (http://www.xmlspy.com) by Clifton Williams (Naval Postgraduate School) -->
<?cocoon-process type="xsp"?>
<?cocoon-process type="xslt"?>
<?xml-stylesheet type="text/xsl" href="genericesql.xsl"?>
<xsp:page xmlns:xsp="http://www.apache.org/1999/XSP/Core"
xmlns:esql="http://apache.org/cocoon/SQL/v2">
<page>
<esql:connection>
<esql:driver>sun.jdbc.odbc.JdbcOdbcDriver</esql:driver>
<esql:dburl>jdbc:odbc:clif</esql:dburl>
<esql:username/>
<esql:password/>
<esql:execute-query>
<esql:query>Select PatientID, FName, LName, Email, gender, Address, Title, City, State, PostalCode, Country, HomePhone From Patient</esql:query>
<esql:results>
<header>This is a simple example of using Cocoon to connect to an Access database using the following technologies JBDC:ODBC connection XML Schema XSP, ESQL, and XSL</header>
<esql:row-results>
<department>
```
Figure IV.7  GenericESQL.XML Document
The system in Figure IV.6 uses an XML document, XSP and Java technology to perform generic database connection queries and generate the resultant display. In this design, all the Java development is isolated from the XML developer. The XML developer using the XML-based Web application framework can easily establish multiple database queries within the XML document without understanding Java programming behind the scenes, and can produce XML documents in whatever desired format for presentation.

F. ANALYSIS OF RESULTS

The XML-based Web Publishing Framework supports the distributed database architecture using XML as the interface language. A distributed database system with multiple sites needs to maintain local autonomy to be able to support local DBMS
requirements for manageability. Using the XML technologies, XML documents with meta-data encapsulation, XML schemas and XML namespaces allows the local DBA to define which information needs to be used within the local DBMS. Distributed DBMS must be able to maintain location transparency, replication transparency, and failure transparency. XML-based Web Publishing Framework provides location transparency which allows users to make queries or updates to database systems without knowing the location of the data. Failure transparency is built in with the use of Java technologies. J2EE EJBs provide a high-level specification for a server side component model. EJBs are designed to run in distributed environments, so that the beans are built on top of the Remote Method Invocation (RMI). The EJB distributed applications hide low-level details such as location, transaction processing, object creation, and persistence. Platform independence is maintained since any EJB container can run on any platform, thus this architecture supports the heterogeneous solution; further it is compatible with COBRA.

Using EJB in XML Based Web Publishing Framework is just a matter of setting the Servlet environment to acts a a client EJB. So on one side EJB server running and listening for upcoming request, and on the other side the it starts the Servlet container with the right EJB client libraries so that whatever Servlet (or Cocoon code through XSP page for instance) the user writes can contain EJB invocations. The internet transaction require users to employ a two-phase commit transaction for asynchronous transactions. Asynchronous transactions support the Internet communication medium, and account for the issues of bandwidth, availability, latency and asynchronous transfer of information. In addition, support is provided by distributed composite transactions composed of sub-transactions. Asynchronous transactions allow a unidirectional update to propagate from data source to target. XML documents work well with asynchronous replication in a distributed system, and with occurrences of network failures. XML supports the unlimited demands of data replication. XML reduces the complexity and cost of updating both the logic and the content of a Web site because of the use of the MVC design approach. Whenever a relation is updated, it must be updated at each site that holds a copy. Synchronized updating in near real time requires careful coordination.
The thesis prototype provides insights into addressing the problem of database heterogeneity in a distributed internet-based environment using the XML. The creation of XML wrappers is necessary to make XML the universal mechanism for addressing heterogeneity. This research used wrappers to encapsulate the meta-data information. While XML provides a presentation mechanism for the query results from heterogeneous sources, the reverse process, that is, writing back to heterogeneous sources is also supported. XML provides a significant degree of transparency to underlying data.

The XML-based Web-publishing framework directly addresses challenges facing today’s distributed database systems in the form of interoperability, autonomy and interactivity. The use of Java technologies gives our implementation the flexibility to run on various platforms while the usage of the XML schema to encapsulate data provides autonomy from the underlying DBMS.

Performance issues involving middleware technologies were not addressed in this thesis. The database implementation runs every client’s request on its own thread space on the server. This enhances the overall performance of the system in terms of both speed and scalability. The latest versions of Internet Explorer and Netscape were used for the client interface.
V. IMPLEMENTATION OF THE WEB APPLICATION FRAMEWORK TO ENABLE TRANSLATION BETWEEN XML AND VRML 3D SIMULATION.

A. INTRODUCTION

The Virtual Reality Modeling Language (VRML) is a Web-based graphics language for building 3D models. The XML-based Web Publishing Framework easily supports three-dimensional simulations utilizing X3D and VRML. Three-dimensional (3D) modeling and simulations provide insights into operations, which cannot be unrealized using standard two-dimensional (2D) renditions. The XML-based Web Publishing Framework supports three-dimensional modeling and simulations for operational planning and provides the U.S. Navy a better way of realizing operational limits.

VRML allows users to interaction within a scene through viewpoint, movement, and rotation. VRML worlds are created using scene graphs that are comprised of nodes. The nodes are responsible for displaying shapes, interaction, and movement through the virtual world. GeoVRML 1.0 is an extension of VRML that allows for accurate rendering of geographic data. Extensible 3D (X3D) is the next-generation specification for VRML. It was designed to overcome some of the limitations of the original VRML specification and incorporates the use of the Extensible Markup Language (XML). These technologies are scalable within the XML-based Web Publishing Framework architecture (Figure V.1). This approach to networked 3D graphics that is suitable for the generation and distribution of large-scale virtual environments.
The XML-based Web Publishing Framework utilizes an extremely powerful function of XML of applying multiple or chained XSL stylesheets. The XSL stylesheet converts from one XML representation to XML another. This process may involve intermediate steps converting from component system XML to common representation XML.

B. ENVIRONMENT

This section describes concepts that are fundamental for understanding how complex three-dimensional (3D) environments are created. It discusses the Virtual Reality Modeling Language (VRML), DIS-Java-VRML and Extensible 3D (X3D).
1. **Virtual Reality Modeling Language (VRML)**

The Virtual Reality Modeling Language (VRML) is a Web-based graphics language for building 3D models. VRML allows user interaction within a scene through viewpoint, movement, and rotation. One of the key features of VRML is it is an ISO standard designed for use over the World Wide Web [Nick01].

VRML worlds are created using a scene-graph structure. Scene graphs are simply a hierarchical decomposition of components that will be rendered in a scene. Scene graphs are comprised of various groups of nodes, which together form a virtual world. These nodes are responsible for displaying shapes, interaction, and movement through the world. VRML worlds can be viewed with any VRML-capable browser such as Cosmo Player or Cortona, which can be downloaded at no cost from the internet and support both Internet Explorer and Netscape as plug-ins [Nick01].

There are numerous examples of 3D images and objects available on the Web. These examples demonstrate how groups of nodes are used to create complex 3D objects and virtual worlds. The following list is an excellent reference for 3D examples:

- Naval Postgraduate School VRML Course examples are available at [http://www.web3d.org/TaskGroups/x3d/translation/examples/contents.html](http://www.web3d.org/TaskGroups/x3d/translation/examples/contents.html)
- VRML Sourcebook examples at [http://www.web3d.org/TaskGroups/x3d/translation/examples/Vrml2.0Sourcebook/contents.html](http://www.web3d.org/TaskGroups/x3d/translation/examples/Vrml2.0Sourcebook/contents.html)
- Scenario Authoring and Visualization for Advanced Graphical Environments (Savage) project at [http://web.nps.navy.mil/~brutzman/Savage/contents.html](http://web.nps.navy.mil/~brutzman/Savage/contents.html)

2. **DIS-Java-VRML**

The DIS-Java-VRML Working Group is developing a free open-source software library that allows DIS and VRML to interoperate by implementing Java code. Its goal is
to provide libraries and examples that allow scene developers to build networked 3D worlds that are portable, pervasive, scalable and viewable on any computer with a browser and network connection. [Brut01]

3. Extensible 3D (X3D)

The next-generation specification for VRML is the Extensible 3D (X3D) standard [Brut01]. X3D is a scene graph and text-based encoding designed to overcome several limitations of the VRML standard. X3D includes an Extensible Markup Language (XML) encoding to express identical VRML geometry and behavior structures. X3D is thus a standardized XML tagset for describing the VRML 200x standard for Web-compatible 3D content. Such content is not static but dynamic, driven by a rich set of interpolators, sensor nodes, scripts, and behaviors. [Blais01]

X3D/VRML 200x is compatibly with VRML 97 files. X3D provides new interoperability with other relevant standards including MPEG-4 and an entire family of XML-based languages. X3D further addresses several shortcomings of VRML 97, provides tighter media integration, improved visual quality through advanced-rendering nodes, and enables a component-based approach. [Blais01]

Using the X3D-Edit authoring tool, developers can create valid scene graphs with little trouble. The tool is simple enough that even novice 3D developers can create virtual worlds with relative ease. When generating a scene, the X3D-Edit software limits the developer to only see allowable choices. Only valid nodes can be selected, eliminating guesswork and potential errors. X3D-Edit utilizes IBM’s Xeena XML editor configured to work with the X3D document type definition (DTD). Documents are translated into VRML using the Extensible Stylesheet Language (XSL), and a browser is automatically launched for convenient debugging. [Brut01] Figure 5.2 shows a screen shot of the X3D Edit tool.
Figure V.2  Screen Capture of the X3D Edit Tool

The XML-based Web Publishing Framework utilizing the X3DCocoon Servlet (Appendix G Section B) developed for this prototype system. The Servlet simplifies the rendering of the Web-based graphics language and cuts out the need to store large VRML graphic and HTML files on the server. The Servlet automatically render the VRML, Text, and HTML as requested by the user using only the XD3.xml file and the input XML file, such as HelloWorld.xml (Appendix G Section D). The X3DCocoon Servlet allows users interaction within the Web Publishing Framework using the X3DCocoon Selection Servlet XHTML Input Form (Figure V.3 and source code Appendix G. Section I). The user can select the X3D XML document and select the X3D XSL stylesheet that the user wishes to apply. The current stylesheet selections available to the users are X3DtoHTML.XSL (Appendix G Section C), X3DtoVRML97.XSL (Appendix G Section J) and X3DCocoon.XSL. The X3DCocoon.XSL stylesheet selection applies a wrapper tagset around the X3DtoVrml97.XSL(Appendix G Section J) output and store the document in at the desired location within the framework.
C. LIMITATION WEB FRAMEWORK XML-FO FOR X3D AND A SERVLET FIX TO RENDER X3D DYNAMICALLY

Generating dynamic HTML from XML, viewing XML transformed into Text files, and even seeing VRML applications generated from XML is simply a matter of typing the URL to the desired XML file into your browser and watching the XML-based Web Publishing Framework take action. Java libraries are used for converting XML to some non-markup-based formats. The most stable library is the Apache XML group's Formatting Objects Processor (FOP). This gives the XML-based Web Publishing Framework the ability to turn XML documents into VRML simulations.
The Framework uses the XML extensions on the file to automatically pass processing calls to the DOM and can apply a XSL stylesheet to constructs a VRML document. X3D supports the direct translation to VRML; however the XML-based Web Publishing Framework design required users to hand code a software wrapper around the VRML document. The problem encountered is caused by FOP. FOP needs a XML document to process and call the DOM. The VRML document is not a XML document and the XML-based Web Publishing Framework cannot render the VRML file directly. The X3DCocoon Servlet (Figure V.4) corrects these problems by automatically adding a software wrapper around the X3DtoVRML97.XSL output to create a XML document and saves the XML document in the correct directory location for the XML-based Web Publishing Framework to render.

Figure V.4  X3D Cocoon Servlet Architecture
D. X3DCOCON Servlet Usage in the Web Publishing Framework.

The X3DCocoon architecture description starts with a selection XHTML page. The X3DCocoon Selection Servlet XHTML Input Form provides an HTML over HTTP interface to an X3DCocoon Servlet (see Appendix G, Section B for the associated source code). The Servlet implants the javax.Servlet.http.httpServlet.class. This class also uses the doGet() and doPost() methods. The doPost() method overrides the doGet() method by simplifying the call to doGet(). The X3DCocoon Servlet get() the X3D XML document along with XSL stylesheet selected from the input form.

The Servlet then calls the DOM method using “XSLTProcessor proc = XSLTProcessorFactory.getProcessor();” and the “proc.process(new XSLTInputSource(new java.io.StringReader(output)), new XSLTInputSource(xsltSystemId), new XSLTResultTarget(fileout));” functions. The DOM parses the “output” XML document with the “xsltSystemID” XSL Stylesheet. The method returns the desired serialized results “fileout” to respond to the HTTP request.

The X3DCocoon Servlet received HTTP request and selects the correct XML documents. The X3DCocoon Servlet can apply multiple or chained XSL stylesheets (Figure V.5). The Servlet returns the selected formatted output based on the user selected stylesheet. The XSL stylesheet process may involve intermediate steps converting from X3D XML to VRML then to converts the VRML back to XML to be used in the XML-Based Web Publishing Framework. The X3D to Cocoon Servlet uses the X3DCocoon.xsl to control the development of a VRML output. This selection then tells the Servlet to apply a wrapper tagset around the VRML outputs. The X3DCocoon Servlet selects the X3dToVrml97.xsl stylesheet. The xsltSystemID is changed to X3dToVrml97.xsl to give the user a selection control. The X3DCocoon Servlet store the XML document in the correct XML–based framework location and responses to the client request with a text over HTTP (Figure V.6) output.

A text example using X3DCocoon Servlet, which applies the X3dToVrml97.xsl stylesheet(Appendix G, Section K) to the HelloWorld.XML document are rendered using
Internet Explorer (Figure V.6). The stored XML document is used in the XML-Based Framework to generate VRML from XML and describe in Section D of this Chapter. The X3DCocoon Servlet can also convert a XML Document to HTML Appendix G, Section E by applying the X3dtoHTML.xsl stylesheet (Appendix G, Section D). The HTML example using X3DCocoon Servlet, which applies the X3dtoHTML.xsl stylesheet to the HelloWorld.XML document are rendered using Internet Explorer (Appendix G Section F).

![Diagram of X3DCocoon Servlet Multiple XML document Processing]

Figure V.5    X3DCocoon Servlet Multiple XML document Processing

The Servlet can convert a XML Document to VRML (Figure V.8) by applying the X3dtoVRML97.xsl stylesheets (Appendix G, Section J). The VRML Example using X3DCocoon Servlet, which applies the X3dtoVRML97.xsl stylesheet to the HelloWorld.XML document (Appendix G Section D) are rendered using Cosmo Player in figure V.8.
E. FUNCTIONALITY OF THE FRAMEWORK FOR DISTRIBUTING AND VISUALIZING THREE-DIMENSIONAL SIMULATION UTILIZING X3D AND VRML.

XML-Based Web Publishing Framework allows for VRML 3D simulations using the Architecture in figure V.7. The XML-Based Web Publishing Framework generates 3D simulations using FOP and X3DVRML.XSL (Appendix G Section C) developed for the prototype system. This section documents X3D and VRML three-dimensional simulations using XML-based Web Publishing Framework.

The XML document is validated against an internal and external DTD. The framework automatically responds to client’s XML document request by using the XML
document extension and document name selected by the user such as “CocHelloWorld.xml”.

XML Framework
X3D support

![Diagram of XML database generic connection architecture]

Figure V.7 XML database generic connection architecture

The CocHelloWorld.XML (Appendix G Section G) document is requested by the client browser via a call to the XML document using the Web Publishing Framework URL and document name. The framework, in response to the users request, validates XML document against a DTD and calls several processes using XSP and XSP: FO namespaces and converts the XML data using the X3DVRML.XSL stylesheet (Appendix G, Section C). The Framework renders the output in VRML over HTTP to clients Web browser (Figure IV.8).
The Web Publishing Framework prototype site uses XML and Java technologies in the Web site is design. The CocKelpForest.XML (Appendix G Section H) document is requested by the client browser via a call to the XML document using the Web Publishing Framework URL and document name. In this example the CocKelpForest.XML document was edit to test The XML-Based Web Publishing Framework’s, ability to response to the users request, calls several processes using XSP and XSP: FO namespaces and converts the XML data using the X3DVRML.XSL stylesheet (Appendix G, Section C). The XML document internal links were change to call only use stored VRML files to render the full scene. The Framework returns VRML over HTTP to the Clients Web browser (Figure V.9).

Figure V.8   HelloWorld or CocHelloWorld VRML display
The Web Publishing Framework prototype site uses XML and Java technologies in the Web site design. The CocAmphibiousRaid.XML (Appendix G Section I) document is requested by the client browser via a call to the XML document using the Web Publishing Framework URL and document name. In this example, the CocAmphibiousRaid document was not edited. The Based-Based Web Publishing Framework responded to the users request, called several processes using XSP and XSP: FO namespaces and converted the XML data using the X3DVRML.XSL stylesheet (Appendix G, Section C). The Framework returned VRML over HTTP to the client’s Web browser (Figure V.10).
F. SUMMARY

The XML-based Web Publishing Framework supports 3D simulations utilizing X3D and VRML. X3D overcomes some of the limitations of the original VRML specification and incorporates the use of the Extensible Markup Language (XML). These technologies are scalable within the XML-based Web Publishing Framework architecture. This approach is suitable for the generation and distribution of large-scale virtual environments.

The XML-based Web Publishing Framework, allowed for the separation between application programming and Web presentation. The incorporation of a Model, View, and Controller (MVC) design approach provided a clean separation between different components (logic, presentation, and data) of information and the programming
functionality. The XML-based Web Publishing Framework separates the Web developer’s from the X3D and/or Java developers’.

The XML-Based Web Publishing Framework supports 3D modeling, addressed the XML-based data exchange and developed an on the fly X3D simulation presentations. The XML-based Web publishing Framework reduces the need to store multiple versions of the same output. The sites only need to store a single stylesheet for each output and the XML documents. The framework reduces complexity in site maintenance.
VI. CONCLUSIONS AND RECOMMENDATIONS

A. INTRODUCTION

This chapter presents conclusions drawn from the Network Application Server using Extensible Mark-Up Language (XML) to support distributed databases and 3D environments. Recommendations for future research related to this thesis are also presented.

B. CONCLUSIONS

The approach adopted in this thesis used an XML-based Web Publishing framework as a more efficient means of providing systems interoperability, and demonstrated the ability of XSL stylesheets to enable automated translations between XML and desired system outputs. This approach also allows the DoD to lower system integrations costs. The framework demonstrated the ability to view each system separately and deal only with the interfaces. The use of these technologies reduces Web site development and maintenance costs.

This research demonstrated the functionality of an XML-based Web Publishing framework, which allows for the separation between application programming and Web presentation. This incorporation of a Model, View, and Controller (MVC) design approach provides a clean separation between different components of information (logic, presentation, and data) and the programming functionality. The Web framework provides the ability to distribute many different forms of data across heterogeneous systems.

The XML-based Web Publishing framework also provides the ability to support the WEN architecture infrastructure. Web application framework easily supports distributed databases and XML-based presentations, including 3-D simulations utilizing X3D and VRML.

This research addressed the problem of sharing information between two or more systems using the XML-based Web Publishing framework. The prototype demonstrates
the framework’s capability to extend relational database management systems (RDBMS) to support the XML-based Web technology. The need for an XML-based database interface was motivated by advances in technology, specifically object-oriented architecture, Java programming language, and middleware technologies, and a concerted effort on the part of Navy to use NXI as part of the WEN scope. The Web Publishing framework supports distributed systems that employ some of the latest technological tools. This solution highlights the use of Java, XML and other Java technologies to implement a truly scalable, distributive and cost-effective system. In the development of the Web Publishing framework system, this research evaluated several developmental tools very carefully before selecting the Cocoon platform for prototype testing. The disadvantage of Java is in the slow execution speed of the byte code, but for the WEN application, speed over Internet connection should not be a major concern. The WEN application is based on the TCP/IP WAN model and more importance should be attached to the completeness of a transaction than to speed. The Navy needs systems that are totally heterogeneous and that can reliably do distribution with minimal blocking on method invocations.

The XML-based Web Publishing framework supports three-dimensional modeling, addressing the XML-based data exchange, and then developing “on the fly” X3D simulation presentations. The XML-based Web Publishing framework client response is created during document production. The client's browser performance is dramatically improved since clients start receiving data as soon as the Framework creates it, rather than after all processing stages are completed. The Web publishing Framework reduces the need to store multiple versions of the same output. The sites only need to store a single stylesheet for each output and the XML documents. The current web 3D design [http://www.web3d.org/TaskGroups/x3d/translation/examples/contents.html] stores multiple versions of the same data in different document formats (HTML, VRML, X3D). The framework reduces complexity in site maintenance. A developer no longer needs to track, update and maintain multiple versions of this data in different formats. These functions are accomplished by just changing one X3D.XML document. The XML-based Web Publishing framework automatically handles the document type of format.
response to the user request. Since most of the server processing required in Cocoon is incremental, an incremental model allows XML production events to be transformed directly into output events with character streaming, thus avoiding the need to store them in memory. Reduced memory needs allow a greater number of concurrent operations to take place simultaneously, thus allowing the publishing system to scale as the load increases [Axml01].

C. RECOMMENDATIONS FOR FUTURE WORK

The XML-based Web Publishing Framework supports an unlimited amount of Web applications services; all of the constraints within this research were imposed to limit the scope of this thesis to demonstrate an effective proof of principle. Future work should focus on the following:

- The incorporation of the Web Publishing Framework in an Enterprise Environment using Enterprise Java Beans. Using EJB in XML Based Web Publishing Framework Enterprise Environment should be a matter of setting the Servlet environment to acts a client EJB. So on one side EJB server running and listening for upcoming request, and on the other side, it starts the Servlet container with the right EJB client libraries so that whatever Servlet (or Cocoon code through XSP page for instance) the user writes can contain EJB invocations.

- The continued development of an XML schema and XSL stylesheet that automatically generates a 3D visualization of the operational scenarios. Work is ongoing and close to completion. Continued work and collaboration with the XML-MTF Development Team, Naval Undersea Warfare Command, and Institute for Defense Analysis will ensure a robust schema is created that combines elements of USMTF and the XML based Web Publishing Framework. Once the scenario can be, auto generated in 3D, it can be extended in functionality and complexity of the server to provide presentation as requested for planning or post operational reviews.

- The development of a distributed database to support X3D data storage. The X3D virtual world should stream line the current data and storage to reduce complexity of the system in the current a data structure. The use of distributed database storages would increase the system ability to support current scenarios and future scenarios that are more complex. As 3D models are created to include additional ships, tanks, bulldozers, aircraft, motor transportation assets, weapons systems, individual weapons, artillery, and realistic humanoids the database would act as a repository for standardized X3D objects.
APPENDIX A. WEB PUBLISHING FRAMEWORK EVALUATION

A. INTRODUCTION

As of the date of this research (November 2001), the available publishing frameworks, which support the requirements, are limited. One of the best resources currently available products is XML Software’s list at http://xmlsoftware.com/publishing/. An evaluation rating was applied to frameworks resource (Section B).

B. RESOURCE

<table>
<thead>
<tr>
<th>Products</th>
<th>Evaluation Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resin</td>
<td></td>
</tr>
<tr>
<td>Version: 1.2</td>
<td>Good</td>
</tr>
<tr>
<td>Developer: Caucho Technology</td>
<td></td>
</tr>
<tr>
<td>License: Open source</td>
<td>Good</td>
</tr>
<tr>
<td>Platforms: JSP</td>
<td>Limited</td>
</tr>
<tr>
<td>Resin creates Web applications with server side JavaScript and JSP 1.0. Its focus lies on server page generation with XSLT.</td>
<td>Limited</td>
</tr>
<tr>
<td>Includes XML DOM parser XPath queries and, XSLT engine</td>
<td>Good</td>
</tr>
<tr>
<td>Supports JSP tag libraries with XSLT</td>
<td>Good</td>
</tr>
<tr>
<td>Java HTTP/1.1 Web server</td>
<td>Good</td>
</tr>
<tr>
<td>JSDK 2.1 Servlet-engine</td>
<td>Good</td>
</tr>
<tr>
<td>Supports Unix and Windows Web servers</td>
<td>Good</td>
</tr>
<tr>
<td>Supports July XSL draft (?)</td>
<td>??</td>
</tr>
<tr>
<td>XML Template Pages creates full-powered JSP pages from simple XML source</td>
<td>Limited</td>
</tr>
<tr>
<td>JSP tag libraries are easy to create with XTP</td>
<td>Good</td>
</tr>
<tr>
<td>XSLT-lite simplifies the design of XSL stylesheets</td>
<td>Good</td>
</tr>
<tr>
<td><strong>X4Dialog</strong></td>
<td></td>
</tr>
<tr>
<td>------------------</td>
<td>------------------</td>
</tr>
<tr>
<td><strong>Version:</strong> 1.0</td>
<td>Early, Not</td>
</tr>
<tr>
<td><strong>Developer:</strong> Oliver Bruening</td>
<td>Considered</td>
</tr>
<tr>
<td><strong>License:</strong> Free for non-commercial use</td>
<td>Not Considered</td>
</tr>
<tr>
<td><strong>Platforms:</strong> Sun JDK 1.1.6 or higher</td>
<td>Good</td>
</tr>
</tbody>
</table>

Java-based XML/XSLT publication framework for dynamic Web sites.

| **Relevant** |
|------------------|------------------|
| **Version:** ? | Early, Not        |
| **Developer:** Ensemble | Considered       |
| **License:** Commercial | Not Considered |
| **Platforms:** | ?? |

XML-powered dynamic Web publishing tool. Creates HTML pages on the fly using templates, can email or fax retrieved information, and supplies an e-commerce solution. Content management features include authorization/access control and purging of out-of-date information. Creates valid or well-formed XML documents.

| **TalvaStudio** |
|------------------|------------------|
| **Version:** Beta 1 | Early, Not        |
| **Developer:** Talva corporation | Considered       |
| **License:** Free | No Source Code |
| **Platforms:** WWW | ?? |

Checkout, edit, check-in, lock, rename, copy, delete files. Text files are automatically indexed (full text indexing) in real time, as they are included in the
netfolder. Manage your XML server with administration tools. Access a J2EE development environment to dynamically produce your XML documents. Use a rich library of XML based Web services that you can re-use in your applications.

<table>
<thead>
<tr>
<th>Frontier</th>
</tr>
</thead>
<tbody>
<tr>
<td>Version: 5.1.6</td>
</tr>
<tr>
<td>Developer: Userland</td>
</tr>
<tr>
<td>License: Commercial; free evaluation available</td>
</tr>
<tr>
<td>Platforms: Macintosh and Windows</td>
</tr>
</tbody>
</table>

Frontier 5.1 is a cross-platform content management system for Windows and Macintosh. It features a powerful Website framework, high-performance object database, multi-threaded runtime, and system-level scripting system.

<table>
<thead>
<tr>
<th>XML Portal Server</th>
</tr>
</thead>
<tbody>
<tr>
<td>Version: ?</td>
</tr>
<tr>
<td>Developer: Sequoia Software Company</td>
</tr>
<tr>
<td>License: Commercial; eval license available</td>
</tr>
<tr>
<td>Platforms: Windows NT</td>
</tr>
</tbody>
</table>

The XML Portal Server provides an information delivery mechanism powered by XML. Offers strong search and retrieval capabilities. You can connect it to any business application and streamline data to and from the portal.

<table>
<thead>
<tr>
<th>Hiawatha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Version: 0.1</td>
</tr>
<tr>
<td>Developer: Paul Tchistopolksii</td>
</tr>
<tr>
<td>License: Open source</td>
</tr>
<tr>
<td>Product</td>
</tr>
<tr>
<td>--------------------------------</td>
</tr>
<tr>
<td>Lightweight Web server “for those who are fluent in XSL”. Standalone Web server with support for XML, XSL (T), XSLScript, HTTP, and CGI (GET and POST). The distribution includes Saxon XSLT processor. Product Page</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Version: 4.1</td>
<td>Good</td>
<td></td>
</tr>
<tr>
<td>Developer: The Magnus Group, Inc.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>License: Commercial</td>
<td>Not Considered</td>
<td></td>
</tr>
<tr>
<td>Target 2000 is an Oracle based product to assist users to repurpose, repackage, a republish subsets of their content for print, on-line, Web, and multimedia. Supported by an easy to use multi-user GUI toolkit which provides: multi-user editing, automatic creation of new products, storage of multimedia data, CDROM creation, fully tagged SGML, XML, or HTML pages, adding and cross-referencing content, Query Tool, archive and change retention, complete redline reports, auto-loading of SGML parsed word processing files; user defined security by user, role, product, shadow files, cloning, spell checking, check in/checkout capability, and integrated work flow. Target also has Internet functionality, a full featured API, and support COM/Corba objects.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>xmltr: XML Translation Suite for Frontier</th>
<th>Platforms: Frontier</th>
<th>Limited, Not Considered</th>
</tr>
</thead>
<tbody>
<tr>
<td>Developer: The Design Group</td>
<td></td>
<td></td>
</tr>
<tr>
<td>License: Free</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Xmltr is a suite for UserLand Frontier. You can use xmltr to translate documents marked up with Extensible Markup Language (XML) into alternate representations such as HTML for publication on the Web via the Frontier Web Site Framework or to a tool-specific markup language for print publication.

<table>
<thead>
<tr>
<th>UltraXML</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Version: 2.0</td>
<td>Good</td>
</tr>
<tr>
<td>Developer: WebX Systems</td>
<td></td>
</tr>
<tr>
<td>License: Commercial</td>
<td>Not Considered</td>
</tr>
<tr>
<td>Platforms: Windows 95/98/NT4.0/2000.</td>
<td>Limited, Not Considered</td>
</tr>
</tbody>
</table>

Native WYSIWYG integrated XML editor solution. UltraXML is a comprehensive XML solution that allows document creation, workflow, and publishing. Needs PowerPublisher. Features:

<table>
<thead>
<tr>
<th>XML Professional Publisher</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Version: 7.0</td>
<td>Good</td>
</tr>
<tr>
<td>Developer: XyEnterprise</td>
<td></td>
</tr>
<tr>
<td>License: Commercial</td>
<td>Not Considered</td>
</tr>
<tr>
<td>Platforms: WindowsNT, UNIX and IBM AIX</td>
<td>Good</td>
</tr>
</tbody>
</table>

High performance content formatting and publishing application that composes pages from XML source data and outputs high quality results in XML, PDF, HTML, and traditional PostScript.

<table>
<thead>
<tr>
<th>Schemantix</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Version: 0.3</td>
<td>Early, Not Considered</td>
</tr>
<tr>
<td>Developer: Schemantix</td>
<td></td>
</tr>
<tr>
<td>License: Open source</td>
<td>Good</td>
</tr>
<tr>
<td><strong>Platforms</strong></td>
<td><strong>Java 2; Web server with Servlet and JSP support</strong></td>
</tr>
<tr>
<td>---------------</td>
<td>--------------------------------------------------</td>
</tr>
<tr>
<td><strong>System for developing Web applications using XML Schemas as the core representation of application data structures. Currently only supports SOX; XSDL and DTD support coming soon.</strong></td>
<td><strong>Good</strong></td>
</tr>
<tr>
<td><strong>Eclipse</strong></td>
<td><strong>Version:</strong> 1.1</td>
</tr>
<tr>
<td></td>
<td><strong>Developer:</strong> Chrystal Software</td>
</tr>
<tr>
<td></td>
<td><strong>Platforms:</strong> Microsoft NT 4.0, Solaris 2.6, 2.7</td>
</tr>
<tr>
<td></td>
<td><strong>XML-based solution that adds interactive content and personalization to your existing Web site. Eclipse allows online companies to tailor their information delivery. Uses XML- and Java-based applications to manage and assemble individual pieces of Web-based information to create a content management and delivery solution for the Web, print, CD, or wireless devices.</strong></td>
</tr>
<tr>
<td><strong>Xbuilder</strong></td>
<td><strong>Version:</strong> 2.5</td>
</tr>
<tr>
<td></td>
<td><strong>Developer:</strong> Cape Clear</td>
</tr>
<tr>
<td></td>
<td><strong>Platforms:</strong> Windows 95/98/2000/NT</td>
</tr>
<tr>
<td></td>
<td><strong>XBuilder is a tool that speeds up page downloads on database-driven Web sites. This version supports XML and XSL. When XBuilder compiles an XML site, the software transforms the XML and XSL at compile time resulting in HTML that can be served directly to any browser.</strong></td>
</tr>
</tbody>
</table>
### Presenting XML

| Version: 0.5.8 | Early, Not Considered |
| Developer: Daniel Parker | |
| License: Open source | Good |
| Platforms: Java | Good |

Presenting XML is a framework for Web publishing, which aims to achieve a complete separation of content from presentation. It supports presentation XML content with XSLT stylesheets, as well as additional processing to other formats like PDF. It supports targeting different kinds of media (e.g. browsers, handhelds) with different flavors of markup (e.g. html, WML).  

### Epic (formerly Adept Editor)

| Version: 4.2 | Good |
| Developer: ArborText | |
| License: Commercial | Not Considered |
| Platforms: Unix, Windows | Good |

A high-end validating SGML/XML authoring and publishing tool for serious document work. Supported XML-related technologies include XSL, XLink, and DOM. Now includes an embedded XSL-FO engine, and a change tracking facility.  

### QARE

| Version: 1.0 | Early, Not Considered |
| Developer: Bill la Forge | |
| License: Open source (LGPL) | Good |
| Platforms: Java | Good |

XML/Java portal (in the form of a Java Servlet), which provides a simple-to-use...
platform to process XML over HTTP.

### TopLeaf

| Version: 5.2 | Good |
| Developer: Turn-Key Systems |  |
| License: Commercial | Not Considered |
| Platforms: API: Windows 95, 98, NT4, Linux, SCO Unix; GUI: Windows 95, 98, NT4 | Good |

"TopLeaf is an industrial strength application package for high speed high quality page formatting in the production shop environment. Input data is expected to be marked with XML tagging, under control of the publication's DTD.

### Cocoon

| Version: 2.0 release candidate 1 | Good |
| Developer: Apache Software Foundation |  |
| License: Open source | Good |
| Platforms: Java | Good |
| DOM 2.0 | Good |
| Multiple Parser | Good |
| Supports July XSL draft | Good |
| SAX 2.0 | Good |
| JAXP 1.1 | Good |

Publishing framework HTTPServlet that supports the use of DOM, XML, and XSL to provide Web content. The content is created in XML conforming to a DTD. Cocoon can then process the XML and apply an XSL stylesheet to it for rendering (different stylesheets for different browsers can be used). You can use Cocoon, for example, to create well-formed HTML pages from an XML source. Includes a SAX API and XSLT stylesheet compilation.
<table>
<thead>
<tr>
<th>XML ServerWare</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Version:</strong> 1.0</td>
<td>Early, Not Considered</td>
</tr>
<tr>
<td><strong>Developer:</strong> Swift Incorporated</td>
<td></td>
</tr>
<tr>
<td><strong>License:</strong> Commercial; free evaluation available</td>
<td>Not Considered</td>
</tr>
<tr>
<td><strong>Platforms:</strong> Windows + IIS</td>
<td>Limited, Not Considered</td>
</tr>
</tbody>
</table>

Set of Web server components for transformation of XML content on request and for retrieval of XML-formatted data from RDBMS databases. The transformation component works with MSXML 2 and the Microsoft XSL dialect.

<table>
<thead>
<tr>
<th>Anastasia</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Version:</strong> 1</td>
<td>Early, Not Considered</td>
</tr>
<tr>
<td><strong>Developer:</strong> Scholarly Digital Editions</td>
<td></td>
</tr>
<tr>
<td><strong>License:</strong> Commercial; evaluation version available</td>
<td>Not Considered</td>
</tr>
<tr>
<td><strong>Platforms:</strong> Windows, Macintosh</td>
<td>Limited, Not Considered</td>
</tr>
</tbody>
</table>

XML publishing software for handling large and highly complex XML documents, where extremely precise control is required over their presentation. It can create output in any format, and it is optimized for HTML output direct to Web browsers. Anastasia permits you to publish documents in identical form both on CD-ROM (Macintosh and Windows) and on the internet, from identical scripts. It includes full support for valid XML and SGML documents, and a fully XML-aware search engine.

<table>
<thead>
<tr>
<th>Dynatext</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Version:</strong> 4.2</td>
<td>Good</td>
</tr>
<tr>
<td><strong>Developer:</strong> Enigma, Inc.</td>
<td></td>
</tr>
<tr>
<td><strong>License:</strong> Commercial</td>
<td>Not Considered</td>
</tr>
<tr>
<td>Platforms: Unix, Windows</td>
<td>Good</td>
</tr>
<tr>
<td>--------------------------</td>
<td>------</td>
</tr>
<tr>
<td>Professional publishing system with support for native SGML and XML. You can use it to publish from a single source via any electronic media, such as SGML-based electronic books, CD-ROMs, or HTML or XML pages. Includes publisher-controlled stylesheets, stand-alone browser for viewing, multiple language support, and multiple content views. Supports authoring with Word, Framemaker, and Interleaf.</td>
<td></td>
</tr>
</tbody>
</table>

**IXIASOFT XML Content Server (TEXTML Server)**

<table>
<thead>
<tr>
<th>Version: 2.0</th>
<th>Good</th>
</tr>
</thead>
<tbody>
<tr>
<td>Developer: IXIASOFT</td>
<td></td>
</tr>
<tr>
<td>License: Commercial; free evaluation version for up to 1000 documents</td>
<td>Not Considered</td>
</tr>
<tr>
<td>Platforms: Server: Windows NT 4.0; Client: Internet Explorer 5.0</td>
<td>Limited, Not Considered</td>
</tr>
</tbody>
</table>

The TEXTML Server is an XML document server whose purpose is to store, index, and retrieve large quantities of XML documents. Geared for anyone looking to implement a Web-based XML document management component within a larger solution the TEXTML Server features a documented COM API with an Active Server Page toolkit.

**Dynabase**

<table>
<thead>
<tr>
<th>Version: 3.1</th>
<th>Good</th>
</tr>
</thead>
<tbody>
<tr>
<td>Developer: Inso</td>
<td></td>
</tr>
<tr>
<td>License: Commercial</td>
<td>Not Considered</td>
</tr>
<tr>
<td>Platforms: Microsoft Internet Information Server on Windows NT 4.0, Netscape Enterprise Servers on Windows NT 4.0, Sun Solaris 2.6, Macintosh</td>
<td>Good</td>
</tr>
</tbody>
</table>
Professional application with both powerful content management features and dynamic server environment, aimed at publishing intra/internet Webs. It is designed to handle types of content like HTML, graphics, scripts, applets, and multimedia files, and to work with a variety of editors. Includes an object-oriented repository for version-controlled storage of Web content. Dynabase includes a Web server plug-in and a framework for publishing Web pages on the fly.

### Rocket

<table>
<thead>
<tr>
<th>Version: 0.2d</th>
<th>Early, Not Considered</th>
</tr>
</thead>
<tbody>
<tr>
<td>Developer: Micheal Floyd</td>
<td></td>
</tr>
<tr>
<td>License: Free for non-commercial use</td>
<td>Not Considered</td>
</tr>
<tr>
<td>Platforms: Windows</td>
<td>Limited, Not Considered</td>
</tr>
</tbody>
</table>

Framework for creating XML-based Web sites. "In a nutshell, Rocket is a collection of skeleton XML documents, XSL style sheets, and DTD's that you can use as a basis for creating your own XML-based Web site. Using Rocket, you can transform XML documents and serve them to any browser, regardless of its capabilities. Rocket also allows you exchange XML streams between XML-capable browsers and HTTP servers. Currently, Rocket is set up to operate with Active Server Pages (ASPs). However, there is nothing to prevent you from dropping the framework into a Servlet environment, or running it in conjunction with Perl's XML: parser module. The one caveat is that some style sheets may have to be tweaked to work with newer style-sheet processors." – From product page.

### Xpublish

<table>
<thead>
<tr>
<th>Version: 2.0a-2</th>
<th>Good</th>
</tr>
</thead>
<tbody>
<tr>
<td>Developer: Media Design in Progress</td>
<td></td>
</tr>
<tr>
<td>License: Commercial; free evaluation</td>
<td>Not Considered</td>
</tr>
<tr>
<td>Platforms: Macintosh</td>
<td>Limited, Not Considered</td>
</tr>
</tbody>
</table>
"XPublish (TM) is a professional Macintosh XML publishing system for efficient development and maintenance of Websites. It works by automatically generate standard HTML pages from XML documents based on a style sheet and processing rules."

<table>
<thead>
<tr>
<th>Avenue.quark</th>
<th>Considered</th>
</tr>
</thead>
<tbody>
<tr>
<td>Version: Pre-release</td>
<td>Early, Not Considered</td>
</tr>
<tr>
<td>Developer: Quark</td>
<td></td>
</tr>
<tr>
<td>License: Free</td>
<td>No Source Code</td>
</tr>
<tr>
<td>Platforms: Mac OS, Windows</td>
<td>Good</td>
</tr>
</tbody>
</table>

Tool that lets you extract the content of QuarkXPress documents and store that content in an XML format specified by a DTD. Tagging rules in Avenue.quark let you associate styles and structures in QuarkXPress documents with XML elements.

<table>
<thead>
<tr>
<th>PerXML</th>
<th>Early, Not Considered</th>
</tr>
</thead>
<tbody>
<tr>
<td>Version: 1.0</td>
<td></td>
</tr>
<tr>
<td>Developer: PerCurrence, Inc.</td>
<td></td>
</tr>
<tr>
<td>License: Commercial; free evaluation version available.</td>
<td>Not Considered</td>
</tr>
<tr>
<td>Platforms: Windows NT/ME/2000</td>
<td>Limited, Not Considered</td>
</tr>
</tbody>
</table>

XML data transformation and development platform. Includes a runtime engine for transforming native XML and legacy data into XML documents using XSLT transformations. Supports major editing environments such as XML Spy and XMetaL Pro. The PerXML Server supports dynamic content integration and delivery in XML, HTML, WML, and most other Web environments.
APPENDIX B.  COCOON INSTALLATION GUIDE

A.  INTRODUCTION

Cocoon is a 100% pure Java publishing framework that relies on new W3C technologies (such as XML and XSL) to provide Web content. The Cocoon project aim is to change the way Web information is created, rendered, and delivered. This new paradigm is based on fact that document content, style and logic are often created by different individuals or working groups.

Cocoon’s goal is to separate site development into three layers. The three layers allow independent designing, creating and managing, reducing management overhead, increasing work reuse and reducing time to publish.

B.  INSTALLATION OF COCOON WEB PUBLISHING FRAMEWORK

The installation of Cocoon is not simple task. This procedure documents how to install the complete Cocoon system. The Cocoon system was loaded on a Windows 2000 Professional operating systems and Windows 2000 Advanced Server operating systems, using Apache Web Server version 1.3.20, Servlet API version 3.2.3, Tomcat Servlet Engine version 3.2.3, the Java Virtual Machine (JVM) SUN JDK version 1.3.1_01 and Cocoon version 1.8.2. The Cocoon Web-publishing framework is an open source system designed to support heterogeneous environments. This Cocoon Web-publishing framework procedure was written with these systems. Cocoon maintains as in Table B.1 listing of configuration which the system were successfully loaded at http://xml.apache.org/cocoon/

<table>
<thead>
<tr>
<th>Operating System</th>
<th>Web Server</th>
<th>Servlet Engine</th>
<th>JVM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Debian Potato or Woody</td>
<td>Apache 1.3.12</td>
<td>JServ 1.1.2</td>
<td>IBM JDK 1.1.8 or 1.3</td>
</tr>
<tr>
<td>Debian Potato</td>
<td>Apache 1.3.14</td>
<td>Tomcat 3.2.1</td>
<td>Sun JDK 1.3</td>
</tr>
<tr>
<td>Debian Woody</td>
<td>JWS 2.0</td>
<td>IAS 4.1.1</td>
<td>IBM JDK 1.3</td>
</tr>
<tr>
<td>Operating System</td>
<td>Web Server</td>
<td>Application Server</td>
<td>Java Runtime Environment</td>
</tr>
<tr>
<td>---------------------------</td>
<td>------------</td>
<td>--------------------</td>
<td>--------------------------</td>
</tr>
<tr>
<td>RedHat Linux 6.0</td>
<td>Apache 1.3.9</td>
<td>Apache JServ 1.0</td>
<td>IBM JDK 1.1.8</td>
</tr>
<tr>
<td>RedHat Linux 6.0</td>
<td>Apache 1.3.9</td>
<td>Apache JServ 1.1b3</td>
<td>IBM JDK 1.1.8</td>
</tr>
<tr>
<td>RedHat Linux 6.0</td>
<td>Apache 1.3.9</td>
<td>Apache JServ 1.0</td>
<td>Blackdown JDK 1.2pre2</td>
</tr>
<tr>
<td>RedHat Linux 6.1</td>
<td>Apache 1.3.9</td>
<td>JRun 2.3.3</td>
<td>IBM JRE 1.1.8</td>
</tr>
<tr>
<td>RedHat Linux 6.1</td>
<td>Apache 1.3.11</td>
<td>Apache JServ 1.1</td>
<td>Sun JDK 1.2.2</td>
</tr>
<tr>
<td>RedHat Linux 6.1</td>
<td>Apache 1.3.11</td>
<td>Apache JServ 1.1</td>
<td>IBM JDK 1.1.8</td>
</tr>
<tr>
<td>RedHat Linux 6.1 (i686)</td>
<td>Apache 1.3.11</td>
<td>Apache JServ 1.1</td>
<td>IBM JDK 1.1.8</td>
</tr>
<tr>
<td>RedHat Linux 6.1</td>
<td>Apache 1.3.12-2</td>
<td>Jserv 1.1.2-2</td>
<td>JDK 1.2.2_006</td>
</tr>
<tr>
<td>RedHat Linux 6.1</td>
<td>Apache 1.3.14</td>
<td>Tomcat 3.2.1</td>
<td>JDK 1.1.6</td>
</tr>
<tr>
<td>RedHat Linux 6.2</td>
<td>Apache 1.3.12</td>
<td>JRun 3.0</td>
<td>Sun JDK 1.2.2</td>
</tr>
<tr>
<td>RedHat Linux 6.2</td>
<td>Apache 1.3.12</td>
<td>JRun 2.3.3</td>
<td>Sun JDK 1.2.2</td>
</tr>
<tr>
<td>RedHat Linux 6.2 (i686)</td>
<td>Apache 1.3.12</td>
<td>JRun 2.3.3</td>
<td>Sun JDK 1.2.2</td>
</tr>
<tr>
<td>RedHat Linux 6.2</td>
<td>Apache 1.3.12</td>
<td>Tomcat 3.1</td>
<td>JDK 1.2.2_006</td>
</tr>
<tr>
<td>RedHat Linux 6.2</td>
<td>JWS 2.0</td>
<td>IAS 4.1.1</td>
<td>IBM JDK 1.3</td>
</tr>
<tr>
<td>RedHat Linux 6.2 (i686)</td>
<td>Apache 1.3.12</td>
<td>Resin 1.2.b1</td>
<td>Sun JDK 1.2.2</td>
</tr>
<tr>
<td>RedHat Linux 7.0</td>
<td>Apache 1.3.12</td>
<td>JServ 1.1.2</td>
<td>Sun JDK 1.3</td>
</tr>
<tr>
<td>Linux Mandrake 7.0</td>
<td>Orion/1.0.3</td>
<td></td>
<td>Sun JDK 1.3.0rc1</td>
</tr>
<tr>
<td>SuSE 6.2 Linux</td>
<td>Apache 1.3.14</td>
<td>JServ 1.1.2</td>
<td>Sun JDK 1.1.7 / IBM JDK 1.3</td>
</tr>
<tr>
<td>SuSE 6.3 Linux</td>
<td>Apache 1.3.9</td>
<td>Apache JServ 1.1</td>
<td>Sun JDK 1.2.2</td>
</tr>
<tr>
<td>Operating System</td>
<td>Web Server 1</td>
<td>Web Server 2</td>
<td>JVM</td>
</tr>
<tr>
<td>------------------</td>
<td>--------------</td>
<td>--------------</td>
<td>------</td>
</tr>
<tr>
<td>SuSE 7.0 Linux (2.2.16)</td>
<td>Apache 1.3.12</td>
<td>Apache JServ 1.1.2, Tomcat 3.1</td>
<td>IBM JDK 1.3</td>
</tr>
<tr>
<td>Windows 98</td>
<td>Apache 1.3.9</td>
<td>Apache JServ 1.0</td>
<td>Sun JDK 1.2.2</td>
</tr>
<tr>
<td>Windows 98</td>
<td>Apache 1.3.9</td>
<td>Apache JServ 1.0</td>
<td>IBM JDK 1.1.7</td>
</tr>
<tr>
<td>Windows 98</td>
<td>Apache 1.3.9</td>
<td>Apache JServ 1.1b3</td>
<td>Sun JDK 1.2.2</td>
</tr>
<tr>
<td>Windows 98</td>
<td>Apache 1.3.9</td>
<td>Apache JServ 1.1b3</td>
<td>IBM JDK 1.1.7</td>
</tr>
<tr>
<td>Windows 98</td>
<td>MS Personal Web Server</td>
<td>ServletExec 2.2</td>
<td>Sun JDK 1.2.1</td>
</tr>
<tr>
<td>Windows 98 SE</td>
<td>Apache 1.3.12</td>
<td>Tomcat 3.1</td>
<td>JDK 1.2</td>
</tr>
<tr>
<td>Windows 98 SE</td>
<td>Tomcat 3.2.1</td>
<td></td>
<td>JDK 1.3</td>
</tr>
<tr>
<td>Windows NT 4.0</td>
<td>IIS 4.0</td>
<td>ServletExec 2.2</td>
<td>Sun JDK 1.2.1</td>
</tr>
<tr>
<td>Windows NT 4.0</td>
<td>IIS 4.0</td>
<td>JRun 2.3.3</td>
<td>Sun JDK 1.2.1</td>
</tr>
<tr>
<td>Windows NT 4.0</td>
<td>Apache 1.3.9</td>
<td>JRun 2.3.3</td>
<td>Sun JDK 1.2.2</td>
</tr>
<tr>
<td>Windows NT 4.0</td>
<td>Tomcat 3.1 Milestone 1</td>
<td></td>
<td>Sun JDK 1.2.2</td>
</tr>
<tr>
<td>Windows NT 4.0 SP3</td>
<td>Apache 1.3.12</td>
<td>JServ 1.1.2</td>
<td>Sun JRE 1.2.2</td>
</tr>
<tr>
<td>Windows NT 4.0 SP4</td>
<td>Apache 1.3.12</td>
<td>Tomcat 3.1</td>
<td>Sun JDK 1.3</td>
</tr>
<tr>
<td>Windows NT 4.0 SP4</td>
<td>BEA Web Logic Server 5.1 SP3</td>
<td></td>
<td>Sun JDK 1.2.2</td>
</tr>
<tr>
<td>Windows NT 4.0 SP5</td>
<td>WLS 6.0 Beta</td>
<td></td>
<td>JDK 1.3</td>
</tr>
<tr>
<td>Windows NT 4.0 SP5</td>
<td>IIS 4.0</td>
<td>JRun 3.0</td>
<td>Sun JDK 1.2.2</td>
</tr>
<tr>
<td>Windows NT 4.0 SP5</td>
<td>IIS 4.0</td>
<td>Web sphere 3.5 Enterprise</td>
<td>IBM JDK 1.2.2</td>
</tr>
<tr>
<td>Windows NT 4.0 SP5</td>
<td>Apache 1.3.14</td>
<td>Tomcat 3.2b8</td>
<td>Sun JDK 1.2.2</td>
</tr>
<tr>
<td>Operating System</td>
<td>Web Server</td>
<td>Servlet Engine</td>
<td>Java Virtual Machine</td>
</tr>
<tr>
<td>---------------------------</td>
<td>----------------</td>
<td>----------------</td>
<td>-----------------------</td>
</tr>
<tr>
<td>Windows NT 4.0 SP6</td>
<td>Apache 1.3.6</td>
<td>JDK 1.1.8</td>
<td>Resin 1.1</td>
</tr>
<tr>
<td>Windows NT 4.0 SP6a</td>
<td>Apache 1.3.11</td>
<td>Apache JServ 1.1</td>
<td>Sun JDK 1.2.2</td>
</tr>
<tr>
<td>Windows NT 4.0 SP6a</td>
<td>Apache 1.3.12</td>
<td>Tomcat 3.1</td>
<td>Sun JDK 1.2.2</td>
</tr>
<tr>
<td>Windows NT 4.0 SP6a</td>
<td>IIS 4.0</td>
<td>Tomcat 3.2.1</td>
<td>Sun JDK 1.3.0</td>
</tr>
<tr>
<td>Windows 2000 Professional</td>
<td>Apache 1.3.12</td>
<td>Apache JServ 1.1</td>
<td>Sun JDK 1.2.2</td>
</tr>
<tr>
<td>Windows 2000 Professional</td>
<td>Apache 1.3.12</td>
<td>Tomcat 3.1</td>
<td>Sun JDK 1.3</td>
</tr>
<tr>
<td>Windows 2000 Professional</td>
<td>Resin 1.1</td>
<td></td>
<td>Sun JERK 1.2.2</td>
</tr>
<tr>
<td>Windows 2000 Professional</td>
<td>JWS 2.0</td>
<td>IAS 4.1.1</td>
<td>Sun JDK 1.3</td>
</tr>
<tr>
<td>Windows 2000 Professional</td>
<td>Dynamo 4.5.1</td>
<td></td>
<td>Sun JDK 1.2.2</td>
</tr>
<tr>
<td>Windows 2000 Professional</td>
<td>Tomcat 3.1</td>
<td></td>
<td>JDK 1.3</td>
</tr>
<tr>
<td>MacOS 8.5+</td>
<td>Resin 1.1b</td>
<td></td>
<td>MRJ 2.2</td>
</tr>
<tr>
<td>MacOS 8.6</td>
<td>Tomcat 3.1</td>
<td></td>
<td>MRJ 2.2.2</td>
</tr>
<tr>
<td>MacOS 8.6</td>
<td>WebSTAR 4.0</td>
<td>JRun 2.3</td>
<td>Mrj 2.1.4</td>
</tr>
<tr>
<td>MacOS 8.6</td>
<td>WebSTAR 4.0</td>
<td>ServletExec 2.1</td>
<td>Mrj 2.1.4</td>
</tr>
<tr>
<td>MacOS 8.6</td>
<td>Quid Pro Quo 2.1.3</td>
<td>ServletExec 2.2</td>
<td>Mrj 2.1.4</td>
</tr>
<tr>
<td>Solaris 2.5.1</td>
<td>Apache 1.3.12</td>
<td>Tomcat 3.1</td>
<td>Sun JDK 1.2.2</td>
</tr>
<tr>
<td>Solaris 2.5.1</td>
<td>Netscape-Enterprise/3.6 SP3</td>
<td>ServletExec 2.2</td>
<td>Sun JDK 1.2.1</td>
</tr>
<tr>
<td>SunOS Netria 5.6</td>
<td>Apache 1.3.9</td>
<td>Apache JServ 1.1b3</td>
<td>Sun JDK 1.1.7</td>
</tr>
<tr>
<td>Solaris 2.6</td>
<td>Apache 1.3.14</td>
<td>JServ 1.1.2</td>
<td>Sun JDK 1.3</td>
</tr>
<tr>
<td>SPARC</td>
<td>Solaris 7</td>
<td>Apache 1.3.14</td>
<td>Locomotive 4.2.0</td>
</tr>
<tr>
<td>------------</td>
<td>-----------</td>
<td>----------------</td>
<td>-------------------</td>
</tr>
<tr>
<td>Solaris 7</td>
<td>Netscape Enterprise Server 3.2</td>
<td>JRun 2.3</td>
<td>Sun JDK 1.2</td>
</tr>
<tr>
<td>Solaris 8 (SPARC)</td>
<td>Apache 1.3.12</td>
<td>Tomcat 3.1</td>
<td>Sun JDK 1.3 Beta Refresh</td>
</tr>
<tr>
<td>Solaris 8 (x86)</td>
<td>Resin 1.2.b1</td>
<td>Apache JServ 1.0</td>
<td>Blackdown JDK 1.1.8</td>
</tr>
<tr>
<td>FreeBSD 3.4</td>
<td>Apache 1.3.9</td>
<td>Apache JServ 1.0</td>
<td>Blackdown jdk-1.2.2-RC4-linux-i386-glibc</td>
</tr>
<tr>
<td>FreeBSD 3.4-STABLE with Linux base-6.1 for Linux-emulation</td>
<td>Jetty Java HTTP Server v2.3.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FreeBSD 4.1 (RELEASE)</td>
<td>Apache 1.3.12</td>
<td>Jserv 1.1.2</td>
<td>JDK 1.1.8</td>
</tr>
<tr>
<td>FreeBSD 4.1 (RELEASE)</td>
<td>Apache 1.3.12</td>
<td>Jserv 1.1.2</td>
<td>Linux JDK 1.2.2</td>
</tr>
<tr>
<td>SCO OpenServer 5</td>
<td>Web Logic 4.5.1</td>
<td></td>
<td>SCO JDK 1.1.7A</td>
</tr>
<tr>
<td>OS/2 Warp 4 FP 12</td>
<td>Gefion Software LiteWebServer</td>
<td></td>
<td>IBM JDK 1.1.8</td>
</tr>
<tr>
<td>SGI IRIX 6.5.7</td>
<td>Apache 1.3.12</td>
<td>Apache JServ 1.1</td>
<td>Sun JDK 1.2.1 (SGI)</td>
</tr>
</tbody>
</table>

Table B.1 Listing Of Configuration System Using Cocoon

C. INSTALLING JAVA VIRTUAL MACHINE

The first program, which needs download and run is the Java Virtual Machine (JVM) (the JAVA interpreter). The JVM reads byte code and translates the code into a language that the computer can understand, possibly storing data values as the program executes. SUN Microsystems provides the JVM in the Java 2 Software Development Kit package J2SDK-1_3_1_01-win.exe which may be obtained from SUN Microsystems at

D. INSTALLING JAKARTA ANT

The Ant program may or may not be needed to install cocoon. The ANT program may be added depending on the individual system needs and if the framework need to changed and recompiled the system. This procedure was added to assist individuals, which may need to build java source code into binary code for cocoon development. Ant operates similarly to a make file program, but Ant is different. Instead of a model where it is extended with shell-based commands, Ant is extended using Java classes. Instead of writing shell commands, the configuration files are XML-based, calling out a target tree where various tasks are executed. Each task is run as an object that implements a particular Task interface.

The ANT build provide for the ability to be cross-platform - to work anywhere and everywhere. Ant has an <exec> task that allows different commands to be executed based on the OS it is executing on.

The source and binary code are distribution to build the Ant. Ant can be obtained at http://jakarta.apache.org/ant. Jakarta-ant-1.4beta2 needs to downloaded and expanded.

Ant supports a number of optional tasks. An optional task is a task, which typically requires an external library to function. The optional tasks are packaged separately from the core Ant tasks. This package is available in the same download directory as the core Ant distribution. Jakarta-Ant-1.4Beta2-optional.jar may be downloaded and placed in the lib directory of the Ant installation.

The external libraries required by each of the optional tasks are detailed in the Library Dependencies section. These external libraries may either be placed in Ant's lib directory, where they will be picked up automatically, or made available on the system CLASS PATH environment variable.

Once you have Ant and Java 2 Software Development Kit installed. ANT requires some additional set up which will be needed to be added in Windows 2000:
Assume Ant is installed in c:\jakarta-ant-1.4Beta2. The following sets up the environment:

1. Select: Start|Setting|ControlPanel

Control Panel Window should OPEN as in figure B.1.

Figure B.1 Windows Control Panel Display

2. Select: System

System Properties Window should OPEN as in figure B.2.
3. Select: Advance Tab | Environment Variables

Environment Variables Window should OPEN as in figure B.3.
4. If the variables are not listed in the System Variable display window.

4a. Select: New

System Variable display window should open as in figure B.4.

Else

4.b Select: Edit
Add the bin directory to your path.

5. Variable Name: PATH
6. Variable Value: %PATH%;%ANT_HOME%\bin
7. Select: OK

Add the ANT_HOME environment variable to the directory where you installed Ant.

8. Variable Name: ANT_HOME
9. Variable Value: c:\jakarta-ant-1.4Beta2
10. Select: OK
11. Variable Name: JAVA_HOME
12. Variable Value: c:\jdk1.3.1_01
13. Select: OK
14. Select: OK
15. Select: OK

The build.xml file for this ANT distribution has the following targets:

ant build - compiles source files into <ANT_HOME>/lib. This is the default target.

ant jar - creates ant.jar

ant javadoc - creates javadoc documentation in docs/javadoc

ant clean - deletes compiled classes and jar files.

After the environment is setup, the program is ready to build the distribution simply by executing the command:
1. Open a Terminal Window

2. Select: Start|Run

3. Open: cmd

DOS Window should OPEN

4. Change directory to ANT_HOME

5. Type: build

6. Press: Enter

Figure B.5 Show the DOS Window Screen Output

```
C:\jakarta-ant-1.4Beta2>build
... Bootstrapping Ant Distribution
JAVA_HOME=C:\jdk1.3.1_01
JAVA=C:\jdk1.3.1_01\bin\java
JAVAC=C:\jdk1.3.1_01\bin\javac
CLASSPATH=C:\jdk1.3.1_01\lib\tools.jar;lib\crimson.jar;lib\jaxp.jar;
classes;src
\main;
... Compiling Ant Classes
Note: Some input files use or override a deprecated API.
Note: Recompile with -deprecation for details.
... Copying Required Files
src\main\org\apache\tools\ant\taskdefs\defaults.properties
    1 file(s) copied.
src\main\org\apache\tools\ant\types\defaults.properties
```
1 file(s) copied.
... Building Ant Distribution
263 File(s) copied
Buildfile: build.xml
bootstrap:
prepare:
check_for_optional_packages:
build:
Created dir: C:\jakarta-ant-1.4Beta2\build\lib
Compiling 77 source files to C:\jakarta-ant-1.4Beta2\build\classes
Note: Some input files use or override a deprecated API.
Note: Recompile with -deprecation for details.
Copying 1 file to C:\jakarta-ant-1.4Beta2\build\classes
Copying 2 files to C:\jakarta-ant-1.4Beta2\build\classes
Copying 2 files to C:\jakarta-ant-1.4Beta2\build\classes\org\apache\tools\ant\taskdefs\optional\junit\xsl
jars:
Building jar: C:\jakarta-ant-1.4Beta2\build\lib\ant.jar
Building jar: C:\jakarta-ant-1.4Beta2\build\lib\optional.jar
dist-lite:
Created dir: C:\jakarta-ant-1.4Beta2\bootstrap
Created dir: C:\jakarta-ant-1.4Beta2\bootstrap\bin
Created dir: C:\jakarta-ant-1.4Beta2\bootstrap\lib
Copying 2 files to C:\jakarta-ant-1.4Beta2\bootstrap\lib
Copying 8 files to C:\jakarta-ant-1.4Beta2\bootstrap\bin

BUILD SUCCESSFUL
Total time: 9 seconds
... Cleaning Up Build Directories
... Done Bootstrapping Ant Distribution
Buildfile: build.xml
main:
prepare:
check_for_optional_packages:
build:
Copying 2 files to C:\jakarta-ant-1.4Beta2\build\classes
jars:
Building jar: C:\jakarta-ant-1.4Beta2\build\lib\ant.jar
dist-lite:
Created dir: C:\jakarta-ant-1.4Beta2\dist
Created dir: C:\jakarta-ant-1.4Beta2\dist\bin
Created dir: C:\jakarta-ant-1.4Beta2\dist\lib
Copying 2 files to C:\jakarta-ant-1.4Beta2\dist\lib
Copying 8 files to C:\jakarta-ant-1.4Beta2\dist\bin
BUILD SUCCESSFUL
Total time: 3 seconds

Figure B.5 ANT Output
E. INSTALLING APACHE

The Apache Web Server needs to be loaded. Apache is an HTTP server, originally designed for Unix systems. Apache was extended to support Microsoft Windows 2000 version[Ahttp01].

Apache Web server is programmed in the C++ program language. Apache is also open source Web server and provides both source code and executable files for listed Operating System. This procedure will use the latest stable executable Apache 1.3.20 Server version. The system must have the Microsoft Installer version 1.10 installed on the PC before it can install the Apache runtime distributions. Windows 2000 is delivered with the Microsoft Installer version 1.10. Instructions on locating the Microsoft Installer, as well as the binary distributions of Apache, are found at http://httpd.apache.org/dist/httpd/binaries/win32/

Note: prior to Apache version 1.3.17. Apache is distributed with an Install Shield 2.0 .exe file. Windows 2000 will not run the Install Shield package.

Apache .msi file is a self-extracting program, which will prompt the user for:

Webmaster name and company name, and whether or not all users should access Apache as a service, or if the system should be installed to run when Webmaster choose the Start Apache shortcut.

Server name, Domain name, and administrative email account.

The directory to install Apache into the default directory (C:\Program Files\Apache Group\Apache although this can be change to any other directory the user wishes). The program will ask for installation type. The "Complete" option installs everything, including the source code if you downloaded the -with_src.msi package. Choose the "Custom" install if you choose not to install the documentation, or the source code from that package.

Select: apache_1.3.20-win32-src-r2.msi and run the installation program.
Note: For standalone testing of Apache. Apache can be setup on LocalHost URL 127.0.0.1 port 80, Server Name: XMLKING. This configuration will allow users to complete Apache load and get the system completely on line prior to Web deployment or for testing purposes. The configuration maybe changed when the system is up and running for deployment. The Apache server can now be called on port 80 by your favorite browser. The browser calls Apache by looping back all server requests to LocalHost, URL 127.0.0.1

1. Select: Start|Program|Apache Http Server|Control Apache Server|Start

Apache Http Server should startup and display figure B.6 in a DOS Window.

```
Apache service is starting
```

Figure B.6 Apache Output

The user can now test the system by type http://localhost/ on a local browser. Figure B.3 Shows the Initial Apache Startup page.
F. INSTALLING JAKARTA-TOMCAT SERVLET ENGINE

Servlets are the analog on the server side to applets on the client side. Servlets are normally executed as part of a Web Server. Servlets have become a popular and are now supported as part of most major Web servers, including the Netscape Web servers, Microsoft’s Internet Information Server (IIS), the W3C Jigsaw Web server and Apache Web Server.

The source and binary code distribution for Tomcat Servlet Engine (Jakarta-Tomcat-3.2.3.zip) can be obtained at download directory at http://jakarta.apache.org/downloads.
Jakarta-Tomcat-3.2.3 requires some additional set up which will be needed for loading Tomcat in Windows 2000[Tom01].

Assume Tomcat is installed in c:\ Jakarta-Tomcat-3.2.3. The following sets up the environment:

1. Select: Start|Setting|ControPanel
   Control Panel Window should OPEN as in figure B.1.

2. Select: System
   System Properties Window should OPEN as in figure B.2.

3. Select: Advance Tab|Enviroment Variables
   Environment Variables Window should OPEN as in figure B.3.

4. If the variables are not listed in the System Variable display window.

4a. Select: New
   System Variable display window should open as in figure B.4.

Else

4.b Select: Edit
   Add the bin directory to your path.

5. Variable Name: PATH

6. Variable Value: %PATH%; %TOMCAT_HOME%\bin

7. Select: OK
   Setting up a CLASSPATH using system variable display window should open as in figure B.4.

8. If the variables are not listed in the System Variable display window.

8a. Select: New
   System Variable display window should open as in figure B.4.
Else

8.b Select: Edit

9. Variable Name: CLASSPATH

10. Variable Value: %TOMCAT_HOME%\classes; (even if does not exist),

11. Select: OK

Setting up a CLASSPATH that contains all of Tomcat dynamically included library jar files. The following jar files are included statically: ant.jar, jasper.jar, jaxp.jar, parser.jar, Servlet.jar, Webserver.jar Setting up a CLASSPATH using system variable display window should open as in figure B.4.

12. Select: Edit

13. Variable Name: CLASSPATH

14. Variable Value: %TOMCAT_HOME%\lib; (even if does not exist),

15. Select: OK

Setting up a CLASSPATH that contains jar file contains the tool javac. Javac contains the files needed for jsp files. Setting up a CLASSPATH, using system variable display window should open as in figure B.4.

16. Select: Edit

17. Variable Name: CLASSPATH

18. Variable Value: %JAVA_HOME%\lib\tools.jar; (even if does not exist),

19. Select: OK

Setting up a TOMCAT_HOME, environment variable using system variable display window should open as in figure B.4.

20. If the variables are not listed in the System Variable display window.

20a. Select: New

System Variable display window should open as in figure B.4.
Else

20.b Select: Edit

21. Variable Name: TOMCAT_HOME

22. Variable Value: c:\jakarata-tomcat-3.2.3

23. Select: OK

24. Select: OK

25. Select: OK

Tomcat can now run in a standalone configuration.

The user can start and stop Tomcat using the scripts to start and stop in the bin subdirectory of TOMCAT_HOME. Recommend placing a Shortcut in the Window 2000 Desktop to add better GUI control of Tomcat. Alternative to run is simply by executing the command:

1. Open a Terminal Window

2. Select: Start|Run

3. Open: cmd

DOS Window should OPEN as in figure B.7.

4. To start Tomcat execute:

C:\jakarata-tomcat-3.2.3\bin\startup.bat
5. To stop Tomcat execute:

C:\jakarta-tomcat-3.2.3\bin\shutdown.bat

6. DOS Window should OPEN displaying: figure B.9. Minimize this screen while Tomcat Servlet Engine is running on the server.
Figure B.10  Tomcat Servlet Engine running

Servlet Examples with Code

This is a collection of examples which demonstrate some of the more frequently used parts of the Servlet API. Familiarity with the Java™ Programming Language is assumed.

These examples will only work when viewed via an http URL. They will not work if you are viewing these pages via a "file://..." URL. Please refer to the README file provided with this Tomcat release regarding how to configure and start the provided web server.

Wherever you see a form, enter some data and see how the servlet reacts. When playing with the Cookie and Session Examples, jump back to the Headers Example to see exactly what your browser is sending the server.

To navigate your way through the examples, the following icons will help:

- Execute the example
- Look at the source code for the example
- Return to this screen

Tip: To see the cookie interactions with your browser, try turning on the "notify when setting a cookie" option in your browser preferences. This will let you see when a session is created and give some feedback when looking at the cookie demo.

Hello World
Request Info
Request Headers
Request Parameters
Cookies
Sessions

Note: The source code for these examples does not contain all of the source code that is actually in the example, only the important sections of code. Code not important to understand the example has been removed for clarity.

Figure B.11  Tomcat Servlet Engine running
The user can test the stand-alone system by type
http://localhost:8080/examples/Servlets/index.html on a browser with results displayed in
figure B.10.

G. CONFIGURING TOMCAT SERVLET ENGINE TO OPERATE WITH
THE APACHE WEB SERVER

The latest version mod_jk plug-in is needed to handle the communications
between Tomcat and Apache and can be obtained at download directory at
http://jakarta.apache.org/builds/jakarta-tomcat/release/v3.2-m1/bin/. The mod_jk can be
obtained in two formats - binary and source. Depending on the platform, a binary version
of mod_jk.dll is available for Windows 2000, recommended using the binary version.
The version of mod_jk is not dependent on the version of Tomcat. The Tomcat 3.3
distribution of mod_jk will function correctly with other 3.x versions of Tomcat

If the binary is not available, follow the instructions for building mod_jk in
Section E of this appendix or copy the binary file mod_jk.dll to the
APACHE_HOME/libexec directory and skip Section E. The Source code is downloaded
during installation of Tomcat. The source for mod_jk is included in the Binary
Distribution of Tomcat in the TOMCAT_HOME/native/mod_jk/ directory. This
directory is organized by Web Server name and version. Each directory contains the
source as well as the appropriate build scripts, make files, or project files.

H. BUILDING MOD_JK FOR WINDOWS

The redirector was developed using Visual C++ version 6.0, so having this
environment is a prerequisite if user needs to perform a custom build.

The steps Build mod_jk are:

1. Change directory to the Apache 1.3 or Apache 2.0 source directory depending on the
version of Apache.
2. Set an APACHE1_HOME environment variable, which points to where your Apache is installed.

3. Execute the following command:

MSDEV mod_jk.dsp /MAKE ALL

   If msdev is not in your path, enter the full path to msdev.exe. In addition, ApacheCore.lib is expected to exist in the APACHE1_HOME\src\CoreD and APACHE1_HOME\src\CoreR directories before linking will succeed. You will need to build enough of the Apache source to create these libraries.

4. Copy mod_jk.dll to Apache's modules directory.

   This will build both release and debug versions of the redirector plug-in (mod_jk). An alternative will be to open mod_jk.dsp in msdev and build it using the build menu.

5. Copy mod_jk.dll to the APACHE_HOME/libexec directory.

I. CONFIGURING APACHE

   This section details the configuration that is required for the Apache Web Server to support mod_jk and recommends removing all mod_jserv directives. Previously configure Apache http Web servers use mod_jserv, remove any ApJServMount directives from your httpd.conf. Remove old tomcat-apache.conf or tomcat.conf. The mod_jserv configuration directives are not compatible with mod_jk.

   The simplest way to configure Apache to use mod_jk is to turn on the Apache auto-configure setting in Tomcat and put the following include directive at the end of your Apache httpd.conf file:

1. Select Start|Programs|Apache httpd Server|Configure Apache Server

2. Click on :Edit the Apache httpd.conf Configuration File.

3. Type: Include C:/jakarta-tomcat-3.2.3/conf/MODJK.conf
This comment was added by Clifton Williams to show the configuration changes made to HTTP.CONF to load the Coocon Web Framework. This include was added below the last closing directory tag </Directory>

```
Include C:/jakarta-tomcat-3.2.3/conf/MODJK.conf
```

Figure B.12   Apache httpd.conf Configuration File

This will tell Apache to use directives in the mod_jk.conf file in the Apache configuration.

**J. CUSTOM CONFIGURATION OF TOMCAT MOD_JK.CONF**

This an important section to understand because Cocoon uses custom configuration to enable all cocoon functions. The user can create custom configurations. This is done by enabling the auto-configuration and copying and renaming the TOMCAT_HOME/conf/auto/mod_jk.conf file a new configuration file, such as TOMCAT_HOME/conf/auto/mod_jk.conf-local.

Tomcat basic configuration:

The system needs to instruct Apache how to load Tomcat. This can be done with Apache's LoadModule and AddModule configuration directives. The mod_jk file informs the Web server of the location of workers.properties file. Mod_jk's uses JkWorkersFile configuration directive.

The user should specify a location of where mod_jk is going to place log file and a log level to be used. This is done using the JkLogFile and JkLogLevel configuration directives. Possible log levels are `debug`, `info`, `error` and `emerg`, but `info` should be in the user’s default selection. The directive JkLogStampFormat will configure the date/time format found on mod_jk log file.
A simple example would be to include the following lines in the Apache httpd.conf file:

LoadModule jk_module libexec/mod_jk.so
AddModule mod_jk.c
JkWorkersFile c:/jakarta-tomcat-3.2.3/conf/workers.properties
JkLogFile c:/jakarta-tomcat-3.2.3/logs/mod_jk.log
JkLogLevel info
JkLogStampFormat "[%a %b %d %H:%M:%S %Y] "

Assigning URLs to Tomcat for custom or local version of Mod_jk.conf file, the user can change settings such as the workers or URL prefix. Use mod_jk's JkMount directive to assign specific URLs to Tomcat. In general the structure of a JkMount directive is:

JkMount <URL prefix> <Worker name>

For example the following directives will send all requests ending in .jsp or beginning with /Servlet to the "ajp13" worker, but jsp requests to files located in /otherworker will go to "remoteworker".

JkMount /*.jsp ajp13
JkMount /Servlet/* ajp13
JkMount /otherworker/*.jsp remoteworker

The system can be configured to use the JkMount directive at the top level or inside <VirtualHost> sections of your httpd.conf file.

K. CONFIGURING TOMCAT

In most simple cases, Tomcat can generate the needed Apache configuration. The system can be configured so that when TOMCAT started up it will automatically generate a configuration file for Apache to use mod_jk. Most of the time, nothing is
needed to do change except adding the following statement to TOMCAT_HOME/conf/server.xml file after

<AutoWebApp ... />

<ApacheConfig />

That's it, you can now start Tomcat and Apache and access Tomcat from the Apache server.

**Note:** Settings for mod_jk auto-configuration is new in Tomcat 3.3-b1. For Tomcat 3.2.3 and older versions of Tomcat, the file is created the auto-config file without have to add a directive in server.xml.

Tomcat 3.2.3 server.xml automatically adds new content information and updates TOMCAT_HOME/conf/jk/mod_jk.conf-auto. Later in this guide the user, generate a custom configuration mod_jk.conf-auto file for cocoon operations. This file provides context mounting URL prefixes that are not the default, user can use this file as a base for customized configurations and save the results in another file. If the system user needs to manage the Apache configuration, this file will need to update it whenever a new context is added.

**Note:** The user must restart Tomcat and Apache after adding a new context; Apache doesn't support configuration changes without a restart. In addition, the file TOMCAT_HOME/conf/jk/mod_jk.conf-auto is generated when Tomcat starts, so user needs to start Tomcat before Apache. Tomcat will overwrite TOMCAT_HOME/conf/jk/mod_jk.conf-auto each startup so customized configuration should be kept elsewhere. For example, copy TOMCAT_HOME/conf/jk/mod_jk.conf-auto to TOMCAT_HOME/conf/jk/mod_jk.conf-local before making changes. Tomcat need to be started to generate the configuration file after the initial load.
L. INSTALLING COCOON 1.8.2

The Cocoon program can be obtained at download directory at http://jakarta.apache.org/downloads. Cocoon can be downloaded and expanded. The source and binary code are available for distribution. Cocoon can be built using ANT and/or the binary code can be placed in the CLASSPATH for program development. The latest version Cocoon 1.8.2.zip is available online and is self-extracting.

This procedure will assist individuals in loading the binary code. The steps provided in building Ant would assist the user in building Cocoon from java source code into binary code for development. To make Cocoon work with Tomcat, the user must add a context to Tomcat that describes to Tomcat how to load Cocoon files. Then the user must tell Apache to send certain requests to Tomcat (and consequently Cocoon). Finally, the individual must provide the .XML files to be served by Cocoon.

The first thing to do is to make sure that Cocoon and all the needed components (as explained in the previous section) are visible to the JVM. This means adding a bunch of jar package to the lib in Tomcat 3.2.3. The context in Tomcat describes to Tomcat how and when to load a particular Servlet and Cocoon is one such Servlet. Tomcat knows how to load the Cocoon .jar files. To begin with copy any .jar files from $COCOON_HOME/lib to $TOMCAT_HOME/lib that are necessary for Cocoon to run.

<table>
<thead>
<tr>
<th>Jar filename</th>
<th>Package name</th>
<th>Obtained from</th>
<th>Purpose</th>
<th>Needed at run-time?</th>
<th>Needed at build-time?</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>ant_1_1.jar</td>
<td>Ant 1.1</td>
<td>jakarta.apache.org</td>
<td>Cocoon build system (a bit like Make)</td>
<td>No</td>
<td>Yes</td>
<td>Other versions of Ant may not work.</td>
</tr>
<tr>
<td>bsfengines.jar</td>
<td>Bean Scripting Framework</td>
<td>IBM</td>
<td>Xalan extension functions</td>
<td>Optional</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>bsf.jar</td>
<td>Bean Scripting Framework</td>
<td>IBM</td>
<td>Xalan extension functions</td>
<td>Optional</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Jar Name</td>
<td>Description</td>
<td>Vendor</td>
<td>Is Required</td>
<td>Position in CLASSPATH</td>
<td>Notes</td>
<td></td>
</tr>
<tr>
<td>------------------------</td>
<td>------------------------------------------------</td>
<td>------------------</td>
<td>-------------</td>
<td>-----------------------</td>
<td>----------------------------</td>
<td></td>
</tr>
<tr>
<td>fop_0_15_0.jar</td>
<td>FOP xml.apache.org Converts xsl:fo into PDF output</td>
<td>xml.apache.org</td>
<td>Yes (unless disabled)</td>
<td></td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Sax-bugfix.jar</td>
<td>Fixes error reporting bug</td>
<td>Robin Green</td>
<td>Optional</td>
<td>No</td>
<td>See Below</td>
<td></td>
</tr>
<tr>
<td>Servlet_2.2.jar</td>
<td>Compiling</td>
<td>jakarta.apache.org</td>
<td>No</td>
<td>Yes, always</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stylebook-1.0-alpha.jar</td>
<td>Generating docs</td>
<td>xml.apache.org</td>
<td>No</td>
<td>Yes for docs and dist</td>
<td>Requires Java 2; will be obsoleted by C2</td>
<td></td>
</tr>
<tr>
<td>Turbine-pool.jar</td>
<td>JDBC connection pooling</td>
<td>java.apache.org</td>
<td>Yes, always</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Xalan_1.2_D02.jar</td>
<td>Processing XSLT stylesheets and logic sheets</td>
<td>xml.apache.org</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Xerces_1.2.jar</td>
<td>Parsing XML and outputting XML/HTML/text.</td>
<td>xml.apache.org</td>
<td>Yes</td>
<td>Yes</td>
<td>Position in CLASSPATH is very important (see below)</td>
<td></td>
</tr>
</tbody>
</table>

Table B.2 Cocoon jar files requirements

In addition, you must copy C:/Cocoon1.8.2/bin/cocoon.jar to C:/Jarakata-Tomcat-3.2.3/lib. Tomcat version 3.2.3 will automatically detect any .jar files in the C:/Jarakata-Tomcat-3.2.3/lib directory as in figure B.13.
Next Tomcat will need about the new context to run Cocoon requests. To do this, edit the file `C:/Jarakata-Tomcat-3.2.3/conf/server.xml` and add the following line in figure B.14:

Figure B.13  Windows Display of C:/Jarakata-Tomcat-3.2.3/lib
This tells Tomcat that requests that come in under that partial path "/cocoon" should be mapped to the context defined in the directory "Webapps/cocoon".

Next, the user needs to tell Apache to forward the same partial pathnames to Tomcat. This is done using a custom configuration mod_jk.conf-auto file to enable all cocoon function.

Mod_jk.conf-auto file is regenerated and overwritten whenever Tomcat is started, so don't edit them directly, but instead save to a Cocoon.conf file. This tells Apache to direct .XML requests that come in under that partial path "/cocoon" to the directory under Tomcat C:/Jarakata-Tomcat-3.2.3/conf/Webapps/cocoon/WEB-INF. Configure Cocoon to use the newer Ajpv13 protocol. Both protocols are enabled by default. The "Ajp13" Connection Handler in Tomcat is a faster protocol and the ability to identify requests made via HTTPS. Edit Cocoon.conf to ensure the system contains the correct Ajpv13 protocol using figure B.15.
These files don't actually do anything by themselves. To be activated, a statement need to be included into the main Apache configuration file. To do this, add this to httpd.conf. The simplest way to configure Apache to use cocoon.conf is to turn on the Apache auto-configure setting in Tomcat and put the following include directive at the end of your Apache httpd.conf file:

1. Select Start|Programs|Apache httpd Server|Configure Apache Server
2. Click on :Edit the Apache httpd.conf Configuration File.
3. Type: Include C:/jakarta-tomcat-3.2.3/conf/cocoon.conf
This will tell Apache to use directives in the cocoon.conf file in the Apache configuration.

Finally, we need to set up the actual context that we have defined and pointed requests to above. To do this, we need to create a new directory in Webapps called cocoon. Then we need to make a sub-directory that describes to Tomcat how to map particular files to Cocoon, then we need to fill the sub-directory with our Cocoon source files (.XML files).

First, make a directory and its subdirectory:

1. Using Windows Explorer change directory to

   C:/jakarta-tomcat-3.2.3/Webapps/

2. Select File|New|Folder

3. Name new folder “cocoon”

4. Left Click on cocoon

5. Select File|New|Folder

6. Name new folder “WEB-INF”
Next, copy the template files from the Cocoon distribution:


Copy “Cocoon1.8.2/conf/cocoon.properties” file to “C:/jakarta-tomcat-3.2.3/Webapps/cocoon/WEB-INF” directory.
The user needs edit the C:/jakarta-tomcat-3.2.3/Webapps/cocoon/WEB-INF/Web.xml file (Figure B.18 and Figure B.19) to point to the Cocoon properties file in the same directory. This by changing the text conf/cocoon.properties to WEB-INF/cocoon.properties.
Figure B.19  Web.xml Source Code

Note: that this path is a relative path, and must be so. Don't try to use an absolute path here. It won't work. Also, note that the Web.xml file describes how to map .XML requests to the Cocoon Servlet.

Populate the cocoon context with source .XML files. For testing purposes just use the samples that come along with Cocoon (Figure B.20). Note that some of these are
insecure and SHOULD NOT be available on a production server, because they allow access to arbitrary .XML source code

Finally, you need to stop Tomcat, stop Apache, and then restart the two in order to make the entire new settings load. You should be able to access pages like http://localhost/cocoon/samples/index.xml (Figure B.21).
Figure B.21  Cocoon Index.xml Display
**IMPORTANT:** NoSuchMethodError message may be receive during starting up, make sure that xerces.jar is located before other XML jars in the CLASSPATH, otherwise XSP will not work. Tomcat 3.2.3 constructs its own CLASSPATH automatically and then add the environment CLASSPATH, so manually setting the CLASSPATH before running Tomcat doesn’t work. Instead, rename xml.jar to zxml.jar and parser.jar to zparser.jar.

**M. INSTALLING MICROSOFT XML PARSER (MSXML) 4.0 FOR INTERNET EXPLORER**

Windows Internet Explorer needs a XML Parser for browser to display XML. Microsoft XML Parser (MSXML) 4.0 formerly called the Microsoft XML Parser. This version has a number of improvements compared to MSXML 3.0. MSXML supports the
World Wide Web (W3) Consortium final recommendation for XML Schema, with both DOM and SAX. Microsoft XML Parser (MSXML) 4.0 is self-extracting and loads automatically. MSXML may be downloaded at http://msdn.microsoft.com/xml.

N. INSTALLING VIRTUAL REALITY MODELING LANGUAGE (VRML) AND X3D-EDIT

Installation of a Virtual Reality Modeling Language (VRML) plugins for the user Web browsers is required to use Cocoon with VRML. These plugins can work with any combination of Netscape and Internet Explorer. Installation X3D-Edit is being used to develop and test the Extensible 3D (X3D) tag set for the next-generation Virtual Reality Modeling Language (VRML 200x). X3D-Edit also exercises various X3D graphics rendering and translation implementations. Both X3D-Edit and the VRML plugins may be obtained through the Web site at http://www.Web3d.org/TaskGroups/x3d/translation/README.X3D-Edit.htm. This Web site provides complete and detailed installation directions.

O. INSTALLING ADOBE PORTABLE DOCUMENT FORMAT (PDF) READER

Installation of Adobe Portable Document Format (PDF) reader is required to be used with the user's Web browser. Cocoon can automatically generate PDF from XML files using XSL:FO. Adobe Portable Document Format (PDF) is the open de facto standard for electronic document distribution worldwide. Adobe PDF is a universal file format that preserves all the fonts, formatting, graphics, and color of any source document, regardless of the application and platform used to create it. Adobe Portable Document Format (PDF) reader is self-extracting and loads automatically. Reader may be downloaded at http://www.adobe.com/products/acrobat/
APPENDIX C. EXTENSIBLE HTML

A. INTRODUCTION

The framework’s prototype site uses XHTML in the Web site design. All HTML files were converted into a XML document. A DTD validated the XML files and applied a XHTML stylesheet to create the output file of XHTML. Section B and C are the original HTML browser output and HTML document. Section D, E, and F are the new XML document, the external DTD, and the XHTML browser output.

B. HTML NPS XML SERVER HOME PAGE

```html
<html>
<head>
<meta http-equiv="Content-Type" content="text/html; charset=windows-1252" />
<meta name="GENERATOR" content="Microsoft FrontPage 4.0" />
<meta name="ProgId" content="FrontPage.Editor.Document" />
<title>New Page 1</title>
</head>

<body>
<p><img border="0" src="file:///C:/Program%20Files/Apache%20Group/Apache/htdocs/images/NPS_r01_c1.gif" width="969" alt="NPS Header" height="90" align="middle" /></p>
<p><img border="0" src="file:///C:/Program%20Files/Apache%20Group/Apache/htdocs/images/Flag.gif" alt="Americam Flag" align="left" width="100" height="55" /></p>
<p align="center"><img border="0" src="file:///C:/Program%20Files/Apache%20Group/Apache/htdocs/images/HerrmannHallHomePage.jpg" width="335" height="232" alt="Herrmann Hall" align="middle" /></p>
<h1 align="center">Welcome to NPS's new Extensible Markup Language (XML) based Application Server.</h1>
<hr width="50%" size="8" />
<h2 align="center">Cocoon Web-publishing framework</h2>
</body>
</html>
```
The Cocoon Web Publishing Framework is loaded on a Windows 2000 Professional operating systems, Apache Web Server version 1.3.20, Servlet API version 3.2.3, Tomcat Servlet Engine version 3.2.3, the Java Virtual Machine (JVM) SUN JDK version 1.3.1_01 and Cocoon version 1.8.2. The Web-publishing framework is using open source code to support heterogeneous environments. Cocoon is a 100% pure Java publishing framework that relies on new W3C technologies (such as XML and XSL) to provide Web content. The Cocoon project aim is to change the way Web information is created, rendered and delivered. This new paradigm is based on fact that document content, style and logic are often created by different individuals or working groups.
C. HTML BROWSER OUTPUT

D. XHTML NPS XML SERVER HOME PAGE

```html
<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Transitional//EN" "http://www.w3.org/TR/xhtml1/DTD/xhtml1-transitional.dtd">
<html xmlns="http://www.w3.org/1999/xhtml">
<head>
<title>NPS XML Server Home Page</title>
</head>
<body bgcolor="#FFFFFF" text="#000000" link="#0000FF" vlink="#000080" alink="#FF0000">
<p><img border="0" src="images/NPS_r01_c1.gif" width="969" alt="NPS Header" height="90" align="middle" /></p>
</body>
</html>
```
Welcome to NPS's new Extensible Markup Language (XML) based Application Server.

The Cocoon Web Publishing Framework is loaded on a Windows 2000 Professional operating systems, Apache Web Server version 1.3.20, Servlet API version 3.2.3, Tomcat Servlet Engine version 3.2.3, the Java Virtual Machine (JVM) SUN JDK version 1.3.1_01 and Cocoon version 1.8.2. The Web-publishing framework is using open source code to support heterogeneous environments. Cocoon is a 100% pure Java publishing framework that relies on new W3C technologies (such as XML and XSL) to provide Web content. The Cocoon project aim is to change the way Web information is created, rendered and delivered. This new paradigm is based on the fact that document content, style and logic are often created by different individuals or working groups.
<param name="effect" value="glow" />
<param name="url" valuetype="ref" value="http://www.xmlking.org/manual/misc/tutorials.html" />
</applet> <applet code="fhover.class" codebase="./" width="180" height="26">
<param name="color" value="#000080" />
<param name="hovercolor" value="#0000FF" />
<param name="textcolor" value="#FFFFFF" />
<param name="text" value="Java Servlet Examples" />
<param name="effect" value="glow" />
<param name="url" valuetype="ref" value="http://www.xmlking.org/examples/Servlets/index.html" />
</applet>

<p align="center"><applet code="fhover.class" codebase="./" width="120" height="26">
<param name="color" value="#000080" />
<param name="hovercolor" value="#0000FF" />
<param name="textcolor" value="#FFFFFF" />
<param name="text" value="Cocoon Examples" />
<param name="effect" value="glow" />
<param name="url" valuetype="ref" value="http://www.xmlking.org/cocoon/samples/index.xml" />
</applet>

</p>

<p align="center"><applet code="fhover.class" codebase="./" width="120" height="26">
<param name="color" value="#000080" />
<param name="hovercolor" value="#0000FF" />
<param name="textcolor" value="#FFFFFF" />
<param name="text" value="Clif's Servlets" />
<param name="effect" value="glow" />
<param name="url" valuetype="ref" value="http://www.xmlking.org/Servlet.htm" />
</applet>

</p>

<hr width="50%" size="8" />
<div align="center"><img border="0" src="images/jakarta-logo.gif" alt="Jakarta" width="350" height="77" /><img src="apache_pb.gif" alt="" width="259" height="38" /></div>
E. XHTML TRANSITIONAL DTD

<!--
Extensible HTML version 1.0 Transitional DTD

This is the same as HTML 4.0 Transitional except for changes due to the differences between XML and SGML.

Namespace = http://www.w3.org/1999/xhtml

For further information, see: http://www.w3.org/TR/xhtml1

Copyright (c) 1998-2000 W3C (MIT, INRIA, Keio), All Rights Reserved.

This DTD module is identified by the PUBLIC and SYSTEM identifiers:

PUBLIC "-//W3C//DTD XHTML 1.0 Transitional//EN"
SYSTEM "http://www.w3.org/TR/xhtml1/DTD/xhtml1-transitional.dtd"

$Revision: 1.1 $
$Date: 2000/01/26 14:08:56 $
-->  
<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Transitional//EN" 
"http://www.w3.org/TR/xhtml1/DTD/xhtml1-transitional.dtd">

<!ENTITY % HTMLlat1 PUBLIC  
"-//W3C//ENTITIES Latin 1 for XHTML//EN" 
"xhtml-lat1.ent">

%HTMLlat1;

<!ENTITY % HTMLsymbol PUBLIC  
"-//W3C//ENTITIES Symbols for XHTML//EN" 
"xhtml-symbol.ent">

%HTMLsymbol;

<!ENTITY % HTMLspecial PUBLIC  
"-//W3C//ENTITIES Special for XHTML//EN" 
"xhtml-special.ent">

%HTMLspecial;

<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Transitional//EN" 
"http://www.w3.org/TR/xhtml1/DTD/xhtml1-transitional.dtd">

<!ENTITY % ContentType "CDATA">

<!-- media type, as per [RFC2045] -->
<!ENTITY % ContentTypes "CDATA">
<!-- comma-separated list of media types, as per [RFC2045] -->
<!ENTITY % Charset "CDATA">
<!-- a character encoding, as per [RFC2045] -->
<!ENTITY % Charsets "CDATA">
<!-- a space separated list of character encodings, as per [RFC2045] -->
<!ENTITY % LanguageCode "NMTOKEN">
<!-- a language code, as per [RFC1766] -->
<!ENTITY % Character "CDATA">
<!-- one or more digits -->
<!ENTITY % LinkTypes "CDATA">
<!-- space-separated list of link types -->
<!ENTITY % MediaDesc "CDATA">
<!-- single or comma-separated list of media descriptors -->
<!ENTITY % URI "CDATA">
<!-- a Uniform Resource Identifier, see [RFC2396] -->
<!ENTITY % UriList "CDATA">
<!-- a space separated list of Uniform Resource Identifiers -->
<!ENTITY % Datetime "CDATA">
<!-- date and time information. ISO date format -->
<!ENTITY % Script "CDATA">
<!-- script expression -->
<!ENTITY % StyleSheet "CDATA">
<!-- style sheet data -->
<!ENTITY % Text "CDATA">
<!-- used for titles etc. -->
<!ENTITY % FrameTarget "NMTOKEN">
<!-- render in this frame -->
<!ENTITY % Length "CDATA">
<!-- nn for pixels or nn% for percentage length -->
<!ENTITY % MultiLength "CDATA">
<!-- pixel, percentage, or relative -->
<!ENTITY % MultiLengths "CDATA">
<!-- comma-separated list of MultiLength -->
<!ENTITY % Pixels "CDATA">
<!-- integer representing length in pixels -->
<!-- these are used for image maps -->
<!ENTITY % Shape ",(rect|circle|poly|default)">
<!ENTITY % Coords "CDATA">
<!-- comma separated list of lengths -->
<!-- used for object, applet, img, input and iframe -->
<!ENTITY % ImgAlign "(top|middle|bottom|left|right)">
<!-- a color using sRGB: #RRGGBB as Hex values -->
<!ENTITY % Color "CDATA">
<!-- There are also 16 widely known color names with their sRGB values:

  Black = #000000  Green  = #008000
  Silver = #C0C0C0  Lime   = #00FF00
  Gray   = #808080  Olive  = #808000
  White  = #FFFFFF  Yellow = #FFFF00
  Maroon = #800000  Navy   = #000080
Red    = #FF0000    Blue   = #0000FF
Purple = #800080    Teal   = #008080
Fuchsia= #FF00FF    Aqua   = #00FFFF

<!ENTITY % coreattrs "id          ID             #IMPLIED
class       CDATA          #IMPLIED
style       %StyleSheet;   #IMPLIED
title       %Text;         #IMPLIED">

<!ENTITY % i18n "lang        %LanguageCode; #IMPLIED
xml:lang    %LanguageCode; #IMPLIED
dir         (ltr|rtl)      #IMPLIED">

<!ENTITY % events "onclick     %Script;       #IMPLIED
ondblclick  %Script;       #IMPLIED
onmousedown %Script;       #IMPLIED
onmouseup   %Script;       #IMPLIED
onmouseover %Script;       #IMPLIED
onmousemove %Script;       #IMPLIED
onmouseout  %Script;       #IMPLIED
onkeypress  %Script;       #IMPLIED
onkeydown   %Script;       #IMPLIED
onkeyup     %Script;       #IMPLIED">

<!ENTITY % focus "accesskey   %Character;    #IMPLIED
tabindex    %Number;       #IMPLIED
onfocus     %Script;       #IMPLIED
onblur      %Script;       #IMPLIED">
<!ATTLIST link
  %attrs;
  charset %Charset; #IMPLIED
  href %URI; #IMPLIED
  hreflang %LanguageCode; #IMPLIED
  type %ContentType; #IMPLIED
  rel %LinkTypes; #IMPLIED
  rev %LinkTypes; #IMPLIED
  media %MediaDesc; #IMPLIED
  target %FrameTarget; #IMPLIED
>
<!-- style info, which may include CDATA sections -->
<!ELEMENT style (#PCDATA)>
<!ATTLIST style
  %i18n;
  type %ContentType; #REQUIRED
  media %MediaDesc; #IMPLIED
  title %Text; #IMPLIED
  xml:space (preserve) #FIXED "preserve"
>
<!-- script statements, which may include CDATA sections -->
<!ELEMENT script (#PCDATA)>
<!ATTLIST script
  %coreattrs;
  charset %Charset; #IMPLIED
  type %ContentType; #REQUIRED
  language CDATA #IMPLIED
  src %URI; #IMPLIED
  defer (defer) #IMPLIED
  xml:space (preserve) #FIXED "preserve"
>
<!-- alternate content container for non script-based rendering -->
<!ELEMENT noscript %Flow;>
<!ATTLIST noscript
  %attrs;
>
<!--======================= Frames
=======================================-->
<!-- inline subwindow -->
<!ELEMENT iframe %Flow;>
<!ATTLIST iframe
  %coreattrs;
  longdesc %URI; #IMPLIED
  name NMTOKEN #IMPLIED
  src %URI; #IMPLIED
  frameborder (1 | 0) "1"
  marginwidth %Pixels; #IMPLIED
  marginheight %Pixels; #IMPLIED
  scrolling (yes | no | auto) "auto"
  align %ImgAlign; #IMPLIED
  height %Length; #IMPLIED
  width %Length; #IMPLIED
>
<!-- alternate content container for non frame-based rendering -->
>
Lists

<!-- Unordered list bullet styles -->
<!ENTITY % ULStyle "(disc|square|circle)"/>
<!-- Unordered list -->
<!ELEMENT ul (li)+>
<!ATTLIST ul
  %attrs;
  type %ULStyle; #IMPLIED
  compact (compact) #IMPLIED
>
<!-- Ordered list numbering style -->
1   arabic numbers   1, 2, 3, ...
 a   lower alpha    a, b, c, ...
 A   upper alpha    A, B, C, ...
i   lower roman     i, ii, iii, ...
 I   upper roman    I, II, III, ...

The style is applied to the sequence number which by default is reset to 1 for the first list item in an ordered list.

-->
<!-- LIStyle is constrained to: "(%ULStyle;|%OLStyle;)
-->
<!-- ENTITY % LIStyle "CDATA" -->
<!-- list item -->
<!ELEMENT li %Flow;>
<!ATTLIST li
  %attrs;
  type %LIStyle; #IMPLIED
  value %Number; #IMPLIED
>
<!-- definition lists - dt for term, dd for its definition -->
<!ELEMENT dl (dt | dd)+>
<!ATTLIST dl
  %attrs;
  compact (compact) #IMPLIED>

<!-- definition lists - dt for term, dd for its definition -->
<!ELEMENT dt %Inline;>
<!ATTLIST dt
  %attrs;>

<!-- definition lists - dt for term, dd for its definition -->
<!ELEMENT dd %Flow;>
<!ATTLIST dd
  %attrs;>

<!-- definition lists - dt for term, dd for its definition -->
<!-- Address
==========================================-->
<!-- information on author -->
<!ELEMENT address %Inline;>
<!ATTLIST address
  %attrs;>

<!-- definition lists - dt for term, dd for its definition -->
<!-- Horizontal Rule
==================================-->
<!ELEMENT hr EMPTY>
<!ATTLIST hr
  %attrs;
  align (left | center | right) #IMPLIED
  noshade (noshade) #IMPLIED
  size %Pixels; #IMPLIED
  width %Length; #IMPLIED
>
<!-- definition lists - dt for term, dd for its definition -->
<!-- Preformatted Text
================================-->
<!-- content is %Inline; excluding
"img|object|applet|big|small|sub|sup|font;basefont" -->
<!ELEMENT pre %pre.content;>
<!ATTLIST pre
  %attrs;
  xml:space (preserve) #FIXED "preserve"
>
<!-- definition lists - dt for term, dd for its definition -->
<!-- Block-like Quotes
================================-->
<!ELEMENT blockquote %Flow;>
<!ATTLIST blockquote
  %attrs;>
cite %URI; #IMPLIED
>
<!------------------------- Text alignment
========================================>
<!-- center content -->
<!ELEMENT center %Flow;>
<!ATTLIST center %attrs;
>
<!------------------------- Inserted/Deleted Text
========================================>
<!--
ins/del are allowed in block and inline content, but its
inappropriate to include block content within an ins element
occurring in inline content.
-->
<!ELEMENT ins %Flow;>
<!ATTLIST ins %attrs;
cite %URI; #IMPLIED
datetime %Datetime; #IMPLIED
>
<!ELEMENT del %Flow;>
<!ATTLIST del %attrs;
cite %URI; #IMPLIED
datetime %Datetime; #IMPLIED
>
<!------------------------- The Anchor Element
========================================>
<!-- content is %Inline; except that anchors shouldn't be nested
-->
<!ELEMENT a %a.content;>
<!ATTLIST a %attrs;
charset %Charset; #IMPLIED
type %ContentType; #IMPLIED
name NMTOKEN #IMPLIED
href %URI; #IMPLIED
hreflang %LanguageCode; #IMPLIED
rel %LinkTypes; #IMPLIED
rev %LinkTypes; #IMPLIED
accesskey %Character; #IMPLIED
shape %Shape; "rect"
coords %Coords; #IMPLIED
tabindex %Number; #IMPLIED
onfocus %Script; #IMPLIED
onblur %Script; #IMPLIED
target %FrameTarget; #IMPLIED
>
<!------------------------- Inline Elements
========================================>
<!-- generic language/style container -->
<!ELEMENT span %Inline;>
<!ATTLIST span

148
%attrs;
>
<!ELEMENT bdo %Inline;>
<!-- I18N BiDi over-ride -->
<!ATTLIST bdo
%coreattrs;
%events;
lang %LanguageCode; #IMPLIED
xml:lang %LanguageCode; #IMPLIED
dir (ltr | rtl) #REQUIRED
>
<!ELEMENT br EMPTY>
<!-- forced line break -->
<!ATTLIST br
%coreattrs;
clear (left | all | right | none) "none"
>
<!ELEMENT em %Inline;>
<!-- emphasis -->
<!ATTLIST em
%attrs;
>
<!ELEMENT strong %Inline;>
<!-- strong emphasis -->
<!ATTLIST strong
%attrs;
>
<!ELEMENT dfn %Inline;>
<!-- definitional -->
<!ATTLIST dfn
%attrs;
>
<!ELEMENT code %Inline;>
<!-- program code -->
<!ATTLIST code
%attrs;
>
<!ELEMENT samp %Inline;>
<!-- sample -->
<!ATTLIST samp
%attrs;
>
<!ELEMENT kbd %Inline;>
<!-- something user would type -->
<!ATTLIST kbd
%attrs;
>
<!ELEMENT var %Inline;>
<!-- variable -->
<!ATTLIST var
%attrs;
>
<!ELEMENT cite %Inline;>
<!-- citation -->
<!ATTLIST cite

149
%attrs;
>
<!ELEMENT abbr %Inline;>
<!-- abbreviation -->
<!ATTLIST abbr
%attrs;
>
<!ELEMENT acronym %Inline;>
<!-- acronym -->
<!ATTLIST acronym
%attrs;
>
<!ELEMENT q %Inline;>
<!-- inlined quote -->
<!ATTLIST q
%attrs;
   cite %URI; #IMPLIED
>
<!ELEMENT sub %Inline;>
<!-- subscript -->
<!ATTLIST sub
%attrs;
>
<!ELEMENT sup %Inline;>
<!-- superscript -->
<!ATTLIST sup
%attrs;
>
<!ELEMENT tt %Inline;>
<!-- fixed pitch font -->
<!ATTLIST tt
%attrs;
>
<!ELEMENT i %Inline;>
<!-- italic font -->
<!ATTLIST i
%attrs;
>
<!ELEMENT b %Inline;>
<!-- bold font -->
<!ATTLIST b
%attrs;
>
<!ELEMENT big %Inline;>
<!-- bigger font -->
<!ATTLIST big
%attrs;
>
<!ELEMENT small %Inline;>
<!-- smaller font -->
<!ATTLIST small
%attrs;
>
<!ELEMENT u %Inline;>
<!-- underline -->
<!ATTLIST u
  %attrs;
>
<!ELEMENT s %Inline;>
<!-- strike-through -->
<!ATTLIST s
  %attrs;
>
<!ELEMENT strike %Inline;>
<!-- strike-through -->
<!ATTLIST strike
  %attrs;
>
<!ELEMENT basefont EMPTY>
<!-- base font size -->
<!ATTLIST basefont
  id ID #IMPLIED
  size CDATA #REQUIRED
  color %Color; #IMPLIED
  face CDATA #IMPLIED
>
<!ELEMENT font %Inline;>
<!-- local change to font -->
<!ATTLIST font
  %coreattrs;
  %i18n;
  size CDATA #IMPLIED
  color %Color; #IMPLIED
  face CDATA #IMPLIED
>
<!--==================== Object
======================================-->
<!--
object is used to embed objects as part of HTML pages.
param elements should precede other content. Parameters
can also be expressed as attribute/value pairs on the
object element itself when brevity is desired.
-->
<!ELEMENT object (#PCDATA | param | %block; | form | %inline; | %misc;)*>
<!ATTLIST object
  %attrs;
  declare (declare) #IMPLIED
classid %URI; #IMPLIED
codebase %URI; #IMPLIED
data %URI; #IMPLIED
type %ContentType; #IMPLIED
codetype %ContentType; #IMPLIED
archive %UriList; #IMPLIED
standby %Text; #IMPLIED
height %Length; #IMPLIED
width %Length; #IMPLIED
usemap %URI; #IMPLIED
name NMTOKEN #IMPLIED
tabindex %Number; #IMPLIED
>
param is used to supply a named property value. In XML it would seem natural to follow RDF and support an abbreviated syntax where the param elements are replaced by attribute value pairs on the object start tag.

One of code or object attributes must be present. Place param elements before other content.

To avoid accessibility problems for people who aren't able to see the image, you should provide a text description using the alt and longdesc attributes. In addition, avoid the use of server-side image maps.
longdesc %URI; #IMPLIED
height %Length; #IMPLIED
width %Length; #IMPLIED
usemap %URI; #IMPLIED
ismap (ismap) #IMPLIED
align %ImgAlign; #IMPLIED
border %Length; #IMPLIED
hspace %Pixels; #IMPLIED
vspace %Pixels; #IMPLIED
>
<!-- usemap points to a map element which may be in this document
or an external document, although the latter is not widely
supported -->
<!--================== Client-side image maps
============================-->
<!-- These can be placed in the same document or grouped in a
separate document although this isn't yet widely supported -->
<![CDATA[map ((%block; | form | %misc;)+ | area+)]]>
<!ATTLIST map
 %i18n;
 %events;
 id ID #REQUIRED
 class CDATA #IMPLIED
 style %StyleSheet; #IMPLIED
 title %Text; #IMPLIED
 name CDATA #IMPLIED
>
<!--================ Forms
===============================================-->
<![CDATA[form %form.content;]]>
<!-- forms shouldn't be nested -->
<!ATTLIST form
 %atts;
 action %URI; #REQUIRED
 method (get | post) "get"
 name NMTOKEN #IMPLIED
 enctype %ContentType; "application/x-www-form-urlencoded"
onsubmit %Script; #IMPLIED
 onreset %Script; #IMPLIED
 accept %ContentTypes; #IMPLIED
>
accept-charset %Charsets; #IMPLIED
target %FrameTarget; #IMPLIED

<!--
Each label must not contain more than ONE field
Label elements shouldn't be nested.
-->
<!ELEMENT label %Inline;>
<!ATTLIST label
%attrs;
for IDREF #IMPLIED
accesskey %Character; #IMPLIED
onfocus %Script; #IMPLIED
onblur %Script; #IMPLIED
>
<!ENTITY % InputType "(text | password | checkbox |
radio | submit | reset |
file | hidden | image | button)">
<!-- the name attribute is required for all but submit & reset --
>
<!ELEMENT input EMPTY>
<!-- form control -->
<!ATTLIST input
%attrs;
type %InputType; "text"
name CDATA #IMPLIED
value CDATA #IMPLIED
checked (checked) #IMPLIED
disabled (disabled) #IMPLIED
readonly (readonly) #IMPLIED
size CDATA #IMPLIED
maxlength %Number; #IMPLIED
src %URI; #IMPLIED
alt CDATA #IMPLIED
usemap %URI; #IMPLIED	tabindex %Number; #IMPLIED
accesskey %Character; #IMPLIED
onfocus %Script; #IMPLIED
onblur %Script; #IMPLIED
onselect %Script; #IMPLIED
onchange %Script; #IMPLIED
accept %ContentTypes; #IMPLIED
align %ImgAlign; #IMPLIED
>
<!ELEMENT select (optgroup | option)+>
<!-- option selector -->
<!ATTLIST select
%attrs;
name CDATA #IMPLIED
size %Number; #IMPLIED
multiple (multiple) #IMPLIED
disabled (disabled) #IMPLIED	tabindex %Number; #IMPLIED
onfocus %Script; #IMPLIED
onblur %Script; #IMPLIED
onchange %Script; #IMPLIED
>
<!ELEMENT optgroup (option)+>
<!ATTLIST optgroup
  %attrs;
  disabled (disabled) #IMPLIED
  label %Text; #REQUIRED
>
<!ELEMENT option (#PCDATA)>
<!ATTLIST option
  %attrs;
  selected (selected) #IMPLIED
  disabled (disabled) #IMPLIED
  label %Text; #IMPLIED
  value CDATA #IMPLIED
>
<!ELEMENT textarea (#PCDATA)>
<!ATTLIST textarea
  %attrs;
  name CDATA #IMPLIED
  rows %Number; #REQUIRED
  cols %Number; #REQUIRED
  disabled (disabled) #IMPLIED
  readonly (readonly) #IMPLIED
  tabindex %Number; #IMPLIED
  accesskey %Character; #IMPLIED
  onfocus %Script; #IMPLIED
  onblur %Script; #IMPLIED
  onselect %Script; #IMPLIED
  onchange %Script; #IMPLIED
>
<!--
The fieldset element is used to group form fields. Only one legend element should occur in the content and if present should only be preceded by whitespace. -->

<!ELEMENT fieldset (#PCDATA | legend | %block; | form | %inline; | %misc;)*>
<!ATTLIST fieldset
  %attrs;
>
<!ENTITY % LAlign "(top|bottom|left|right)">
<!ELEMENT button %button.content;>
<!-- push button -->
<!ATTLIST button
  %attrs;
  name CDATA #IMPLIED
  value CDATA #IMPLIED
  type (button | submit | reset) "submit"
  disabled (disabled) #IMPLIED
  tabindex %Number; #IMPLIED
  accesskey %Character; #IMPLIED
  onfocus %Script; #IMPLIED
  onblur %Script; #IMPLIED
>
<!-- single-line text input control (DEPRECATED) -->
<!ELEMENT isindex EMPTY>
<!ATTLIST isindex
  %coreattrs;
  %i18n;
  prompt %Text; #IMPLIED
>
<!-- Tables
=======================================-->
<!-- Derived from IETF HTML table standard, see [RFC1942] --
The border attribute sets the thickness of the frame around the
table. The default units are screen pixels.
The frame attribute specifies which parts of the frame around
the table should be rendered. The values are not the same as
CALS to avoid a name clash with the valign attribute.

-->
<!ENTITY % TFrame "(void|above|below|hsides|lhs|rhs|vsides|box|border)">
<!--
The rules attribute defines which rules to draw between cells:
If rules is absent then assume:
"none" if border is absent or border="0" otherwise "all"
-->
<!ENTITY % TRules "(none | groups | rows | cols | all)">
<!-- horizontal placement of table relative to document -->
<!ENTITY % TAlign "(left|center|right)">
<!-- horizontal alignment attributes for cell contents
  char        alignment char, e.g. char=':
  charoff    offset for alignment char
-->
<!ENTITY % cellhalign "align
(left|center|right|justify|char) #IMPLIED
  char %Character; #IMPLIED
  charoff %Length; #IMPLIED">
<!-- vertical alignment attributes for cell contents -->
<!ENTITY % cellvalign "valign
  (top|middle|bottom|baseline)
  #IMPLIED">
colgroup groups a set of col elements. It allows you to group several semantically related columns together.

```
<!ATTLIST colgroup
  %attrs;
  span %Number; "1"
  width %MultiLength; #IMPLIED
  %cellhalign;
  %cellvalign;
>
```

col elements define the alignment properties for cells in one or more columns.

The width attribute specifies the width of the columns, e.g.

```
width=64        width in screen pixels
width=0.5*      relative width of 0.5
```

The span attribute causes the attributes of one col element to apply to more than one column.

```
<!ATTLIST col
  %attrs;
  span %Number; "1"
  width %MultiLength; #IMPLIED
  %cellhalign;
```
Use thead to duplicate headers when breaking table across page boundaries, or for static headers when tbody sections are rendered in scrolling panel.

Use tfoot to duplicate footers when breaking table across page boundaries, or for static footers when tbody sections are rendered in scrolling panel.

Use multiple tbody sections when rules are needed between groups of table rows.

<!ATTLIST thead
 atts;
 %cellhalign;
 %cellvalign;
>
<!ATTLIST tfoot
 atts;
 %cellhalign;
 %cellvalign;
>
<!ATTLIST tbody
 atts;
 %cellhalign;
 %cellvalign;
>
<!ATTLIST tr
 atts;
 %cellhalign;
 %cellvalign;
 bgcolor %Color; #IMPLIED
>
<!-- Scope is simpler than headers attribute for common tables --
>
<!ENTITY % Scope "(row|col|rowgroup|colgroup)">
<!-- th is for headers, td for data and for cells acting as both
 -->
<!ATTLIST th
 atts;
 abbr %Text; #IMPLIED
 axis CDATA #IMPLIED
 headers IDREFS #IMPLIED
 scope %Scope; #IMPLIED
 rowspan %Number; "1"
 colspan %Number; "1"
 %cellhalign;
 %cellvalign;
 nowrap (nowrap) #IMPLIED
 bgcolor %Color; #IMPLIED
 width %Pixels; #IMPLIED
 height %Pixels; #IMPLIED
>
F. XHTML BROWSER OUTPUT

Welcome to NPS's new Extensible Markup Language (XML) based Application Server.

Cocoon web-publishing framework

The Cocoon Web Publishing Framework is based on a Windows 2000 Professional operating system, Apache Web Server version 2.20, Swover ASI version 3.2.3, Textor Swover Engine version 3.2.3, the Java Virtual Machine (JVM) IBM J2RE version 1.5.0_03 and Cocoon version 3.0.5. The web-publishing framework is using open source code to support heterogeneous environments. Cocoon is a 100% pure Java publishing framework that relies on several W3C technologies such as XSLT and Xindice to provide web content. The Cocoon project aims to change the way web information is created, rendered and delivered. The user interface is based on the JXHTML document connector, XSLT stylesheets are often created by different individuals or working groups.
APPENDIX D. JAVA SERVLET AND JSP EXAMPLES

A. INTRODUCTION

This JSP The JSP Form Page and JSP Handle Form [Tom01]. The JSP form page will be the start page and the error page in this example. Initially it will simply display an HTML form (Appendix D Section C). It will target a form validation Servlet (Appendix D Section D). If the Servlet detects errors in the user input, it will forward the request back to the JSP page(Appendix D Section B). The JSP page will notify the user of errors and redisplay the form with the original user inputs intact.

B. JSP FORM

<jsp:useBean id="form" class="FormBean">
  <jsp:setProperty name="form" property="*"/>
</jsp:useBean>
<html>
<body bgcolor="white">
<% 
  String[] errors = (String[])request.getAttribute("errors");
  if (errors != null && errors.length > 0) {
    %>
  <b>Please Correct the Following Errors</b>
  <ul>
  <% for (int i=0; i < errors.length; i++) { %>
    <li> <%= errors[i] %>
  <% } %>
  </ul>
  <% } %>
</body>
</html>
<form action="<%= request.getContextPath() %>/Servlet/HandleForm" method="post">
  <input type="text" name="name" value="%<jsp:getProperty name="form" property="name"/>%">
  <b>Name</b> (Last, First)<br>
  <input type="text" name="email" value="%<jsp:getProperty name="form" property="email"/>%">
  <b>E-Mail</b> (user@host)<br>
  <input type="text" name="ssn" value="%<jsp:getProperty name="form" property="ssn"/>%">
  <b>SSN</b> (123456789)<br>
  
  <p>
  <input type="submit" value="Submit Form">
  </p>
</form>
</body>
</html>
C. HTML FORM

![HTML Form Image]

D. SERVLET

```java
import java.io.*;
import javax.Servlet.*;
import javax.Servlet.http.*;
import java.util.*;
public class HandleForm extends HttpServlet {
    public void service(HttpServletRequest req,
                         HttpServletResponse res)
                        throws ServletException,
                         IOException {
        // Servlet code goes here
    }
}
```

163
Vector errors = new Vector();
String name = req.getParameter("name");
String ssn = req.getParameter("ssn");
String email = req.getParameter("email");
if (!isValidName(name))
    errors.add("Please specify the name as Last, First");
if (!isValidEmail(email))
    errors.add("Email address must contain an @ symbol");
if (!isValidSSN(ssn))
    errors.add("Please specify a valid SSN number, no dashes");
String next;
if (errors.size() == 0) {  // data is OK
    next = "thanks.jsp";
} else {  // data has errors, try again
    String[] errorArray = (String[])errors.toArray(new String[0]);
    req.setAttribute("errors", errorArray);
    next = "form.jsp";
}
RequestDispatcher rd;
rd = getServletContext().getRequestDispatcher("/" + next);
rd.forward(req, res);
private boolean isValidSSN(String ssn) {  // check for 9 characters, no dashes
    return (ssn.length() == 9 && ssn.indexOf("-") == -1);
}
private boolean isValidEmail(String email) {  // check an @" somewhere after the 1st character
    return (email.indexOf("@") > 0);
}
private boolean isValidName(String name) {  // should be Last, First - check for the comma
    return (name.indexOf(",") != -1);    
}
next = "thanks.jsp";
} else { // data has errors, try again
    String[] errorArray = (String[])errors.toArray(new String[0]);
    req.setAttribute("errors", errorArray);
    next = "form.jsp";
}
RequestDispatcher rd;
rd = getServletContext().getRequestDispatcher("/" + next);
rd.forward(req, res);

private boolean isValidSSN(String ssn) { // check for 9 characters, no dashes
    return (ssn.length() == 9 && ssn.indexOf("-") == -1);
}
private boolean isValidEmail(String email) { // check an "@" somewhere after the 1st character
    return (email.indexOf("@") > 0);
}
private boolean isValidName(String name) { // should be Last, First - check for the comma
    return (name.indexOf(",") != -1);
}
APPENDIX E. WEB PUBLISHING FRAMEWORK'S SOURCE CODE USING SERVLETS FOR GENERIC DATABASE ACCESS

A. INTRODUCTION

The Web Publishing Framework prototype site uses XML and Java technologies in the Web site is design. Section B, C and D are Java Servlet Source Code GenericXMLJdbcAccess.Class, JdbcXmlDB.Class, and JdbcXhtml.Class. Section E is a XML over HTTP document output. Section F is the JDBCHTML.xsl stylesheet source code. Section G XHTML interface form and XHTML source code

B. GENERICXMLJDBCACCESS JAVA SOURCE CODE

```java
package jdbc.xml;

import java.sql.*;
import java.util.*;

/**
 * Title:        GenericXMLJdbcAccess CLASS
 * Description:  The Class encapsulates the functionality required to query a JDBC data source and return the results that query as a well-formed xml Document.
 * Copyright:    Copyright (c) 2001
 * Company: www.xmlking.org
 * @author Clifton Williams
 * @version 1.0
 */

public class GenericXMLJdbcAccess {

    public GenericXMLJdbcAccess () {
        super();
    }

    /**
     * This method apply XML encoding rules
     *
     */
    String encodeXML(String sData) {
```
if (sData!=null) {
    for(int i=0; i < before.length; i++) {
        sData = Replace(sData, before[i], after[i]);
    }
} else {sData="";}
return sData;

/**
 * Used to replace code frament
 */
String Replace (String content, String oldWord, String newWord) {
    int position = content.indexOf(oldWord);
    while (position > -1) {
        content =content.substring(0,position) + newWord +
            content.substring(position + oldWord.length());
        position = content.indexOf(oldWord,position + newWord.length());
    }
    return content;
}

/**
 * This method specified JDBC result set as an XML document
 */
String writeXML(ResultSet rs) {
    StringBuffer strResults = new StringBuffer
        ("<?xml version="1.0" encoding="ISO-8859-1"?>\r\n<resultset>
        ";
    try {
        ResultSetMetaData rsMetadata =rs.getMetaData();
        int intFields = rsMetadata.getColumnCount();
        strResults.append("<metadata>
        ");
        for(int h=1;h<= intFields; h++) {
            strResults.append("<field name=" +
            rsMetadata.getColumnName(h) +
            "");
        }
        strResults.append("</metadata>
        ");
    } finally {
        strResults.append("</resultset>
        ");
    }
    return strResults.toString();
}
"\n\n" + rsMetadata.getColumnTypeName(h) + "\n\n"/>
});
strResults.append("</metadata>\n<records>\n\n" +
while (rs.next())
{
    strResults.append("<record>\n\n");
    for(int i=1; i<=intFields; i++)
    {
        strResults.append("<field name=" +
rsMetadata.getColumnName(i) + "">" + encodeXML(rs.getString(i)) + "</field>\n\n");
    }
    strResults.append("</record>\n\n");
}
}catch(Exception e) {}
strResults.append("</records>\n</resultset>");
return strResults.toString();
}

/**
  *
  * Establish a connection to a database and executes the SQL
  * Query returns String Resultset formated in XML serialized
  * stream
  *
  */

public String execute(String driver, String url, String uid,
String pwd, String sql)
{
    String output = new String();
    try
    {
        Class.forName(driver);
        Connection conn = DriverManager.getConnection(url,uid,pwd);
        Statement s = conn.createStatement();
        ResultSet rs= s.executeQuery(sql);
        output = writeXML(rs);
        rs.close();
        conn.close();
    }
    catch(Exception e)
    {
        output = "<error>" + encodeXML(e.toString()) + "</error>";
    }
    return output;
}
package jdbc.xml;

import javax.Servlet.*;
import javax.Servlet.http.*;
import java.io.*;

/**
 * Title:        JdbcXmlDB CLASS
 * Description:  The Class encapsulates the functionality
 *               required to query a JDBC data source and return
 *               the results that query as a well-formed
 *               xml Document.
 * Copyright:    Copyright (c) 2001
 * Company:      www.xmlking.org
 * @author       Clifton Williams
 * @version 1.1
 */

public class JdbcXmlDB extends HttpServlet {

    public void doGet(HttpServletRequest request,
        HttpServletResponse response) throws IOException, ServletException {
        response.setContentType("text/xml");
        PrintWriter out = response.getWriter();
        GenericXMLJdbcAccess searchOBJ = new GenericXMLJdbcAccess();
        out.println(searchOBJ.execute(request.getParameter("driver"),
            request.getParameter("jdbcurl"),
            request.getParameter("uid"),
            request.getParameter("pwd"),request.getParameter("sql")));
    }

    public void doPost(HttpServletRequest request,
        HttpServletResponse response) throws IOException, ServletException {
        doGet(request, response);
    }

}
D. JDCBXHTMLDB JAVA SOURCE CODE

```java
Package jdbc.xml;

import javax.Servlet.*;
import javax.Servlet.http.*;
import java.io.*;
import org.xml.sax.SAXException;
import org.apache.xalan.xslt.*;

/**
 * Title:        JdbcXhtmlDB CLASS
 * Description:  The Class encapsulates the functionality required to
 *               query a JDBC data source and return the results that
 *               query as a well-formed xml Document. Then applies a
 *               stylesheet to convert the output to HTML
 * Copyright:    Copyright (c) 2001
 * Company:      www.xmlking.org
 * @author       Clifton Williams
 * @version 1.1
 */

public class JdbcXhtmlDB extends HttpServlet {

    public void doGet(HttpServletRequest req, HttpServletResponse res)
                throws IOException, ServletException {

        String qryPath;
        String xsltSystemId = new File("C:/jakarta-tomcat-3.2.3/Webapps/jdbcxml/WEB-INF/classes/jdbc/xml/JDBCHTML.xsl").toURL().toExternalForm();

        if (req.getPathInfo()==null) {
            qryPath = getServletConfig().getServletContext().getRealPath(req.getServletPath());
        } else {
            qryPath = req.getPathTranslated();
        }

        res.setContentType("text/html");
        PrintWriter xmlout = res.getWriter();

        GenericXMLJdbcAccess searchOBJ = new GenericXMLJdbcAccess();
        String output = searchOBJ.execute(req.getParameter("driver"), req.getParameter("jdbcurl"), req.getParameter("uid"), req.getParameter("pwd"), req.getParameter("sql"));
```

171
try {
    XSLTProcessor proc = XSLTProcessorFactory.getProcessor();
    proc.process(new XSLTInputSource(new java.io.StringReader(output)),
               new XSLTInputSource(xsltSystemId), new XSLTResultTarget(xmlout));
} catch (SAXException se) {
    throw new ServletException(se);
}

public void doPost(HttpServletRequest req, HttpServletResponse res) throws IOException, ServletException {
    doGet(req, res);
}

E. XML DATABASE XML OVER HTTP OUTPUT

<?xml version="1.0" encoding="ISO-8859-1" ?>
- <resultset>
  - <metadata>
    <field name="PatientID" datatype="VARCHAR" />
    <field name="FName" datatype="VARCHAR" />
    <field name="LName" datatype="VARCHAR" />
    <field name="Email" datatype="VARCHAR" />
    <field name="gender" datatype="VARCHAR" />
    <field name="Title" datatype="VARCHAR" />
    <field name="Address" datatype="VARCHAR" />
    <field name="City" datatype="VARCHAR" />
    <field name="State" datatype="VARCHAR" />
    <field name="PostalCode" datatype="VARCHAR" />
    <field name="Country" datatype="VARCHAR" />
    <field name="HomePhone" datatype="VARCHAR" />
    <field name="WorkPhone" datatype="VARCHAR" />
    <field name="InsuranceID" datatype="INTEGER" />
    <field name="password" datatype="VARCHAR" />
    <field name="GoodPayCode" datatype="BIT" />
    <field name="Age" datatype="VARCHAR" />
  </metadata>
  - <records>
    - <record>
      <field name="PatientID">Boy</field>
      <field name="FName">Fat</field>
      <field name="LName">Boy</field>
      <field name="Email">fboy@help.me</field>
<field name="gender">Male</field><field name="Title">Professional Pie eater</field><field name="Address">1234 SEA Food ST</field><field name="City">Kenner</field><field name="State">LA</field><field name="PostalCode">700038980</field><field name="Country">USA</field><field name="HomePhone">1213112112</field><field name="WorkPhone">1212121212</field><field name="InsuranceID">2</field><field name="password">fat</field><field name="GoodPayCode">0</field><field name="Age">34</field></record>
<record>
<field name="PatientID">Catttler</field><field name="FName">Cheryl</field><field name="LName">Catttler</field><field name="Email">ccatttler@cow.com</field><field name="gender">Female</field><field name="Title">Book Seller</field><field name="Address">324 Hark lane</field><field name="City">Kenner</field><field name="State">LA</field><field name="PostalCode">700340909</field><field name="Country">USA</field><field name="HomePhone">3451235678</field><field name="WorkPhone">7891237890</field><field name="InsuranceID">1</field><field name="password">cow</field><field name="GoodPayCode">1</field><field name="Age">34</field></record>
<record>
<field name="PatientID">Johnson</field><field name="FName">Micheal</field><field name="LName">Johnson</field><field name="Email">mj@basketball.net</field><field name="gender">Female</field><field name="Title">MR</field><field name="Address">2345 SuperDome ST</field><field name="City">New Orleans</field><field name="State">LA</field><field name="PostalCode">700040000</field><field name="Country">USA</field><field name="HomePhone">5042345556</field><field name="WorkPhone">5045468900</field><field name="InsuranceID">1</field><field name="password">fat</field><field name="GoodPayCode">0</field>
<table>
<thead>
<tr>
<th>Field</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>PatientID</td>
<td>kin</td>
</tr>
<tr>
<td>FName</td>
<td>Barb</td>
</tr>
<tr>
<td>LName</td>
<td>kin</td>
</tr>
<tr>
<td>Email</td>
<td><a href="mailto:bj@flickr.org">bj@flickr.org</a></td>
</tr>
<tr>
<td>gender</td>
<td>Female</td>
</tr>
<tr>
<td>Title</td>
<td>Road washer</td>
</tr>
<tr>
<td>Address</td>
<td>1245 trailer park high</td>
</tr>
<tr>
<td>City</td>
<td>Kenner</td>
</tr>
<tr>
<td>State</td>
<td>LA</td>
</tr>
<tr>
<td>PostalCode</td>
<td>7000000000</td>
</tr>
<tr>
<td>Country</td>
<td>USA</td>
</tr>
<tr>
<td>HomePhone</td>
<td>5042362345</td>
</tr>
<tr>
<td>WorkPhone</td>
<td>5043456788</td>
</tr>
<tr>
<td>InsuranceID</td>
<td>0</td>
</tr>
<tr>
<td>password</td>
<td>bug</td>
</tr>
<tr>
<td>GoodPayCode</td>
<td>1</td>
</tr>
<tr>
<td>Age</td>
<td>35</td>
</tr>
<tr>
<td>PatientID</td>
<td>Taylor</td>
</tr>
<tr>
<td>FName</td>
<td>Andrea</td>
</tr>
<tr>
<td>LName</td>
<td>Taylor</td>
</tr>
<tr>
<td>Email</td>
<td><a href="mailto:catit@ch.her">catit@ch.her</a></td>
</tr>
<tr>
<td>gender</td>
<td>Female</td>
</tr>
<tr>
<td>Title</td>
<td>Lion Tammer</td>
</tr>
<tr>
<td>Address</td>
<td>345 Bloody ST</td>
</tr>
<tr>
<td>City</td>
<td>Metairie</td>
</tr>
<tr>
<td>State</td>
<td>LA</td>
</tr>
<tr>
<td>PostalCode</td>
<td>7003456777</td>
</tr>
<tr>
<td>Country</td>
<td>USA</td>
</tr>
<tr>
<td>HomePhone</td>
<td>9809989874</td>
</tr>
<tr>
<td>WorkPhone</td>
<td>6569899643</td>
</tr>
<tr>
<td>InsuranceID</td>
<td>2</td>
</tr>
<tr>
<td>password</td>
<td>bat</td>
</tr>
<tr>
<td>GoodPayCode</td>
<td>0</td>
</tr>
<tr>
<td>Age</td>
<td>36</td>
</tr>
<tr>
<td>PatientID</td>
<td>Walker</td>
</tr>
<tr>
<td>FName</td>
<td>John</td>
</tr>
<tr>
<td>LName</td>
<td>Walker</td>
</tr>
<tr>
<td>Email</td>
<td><a href="mailto:theif@catchme.com">theif@catchme.com</a></td>
</tr>
<tr>
<td>gender</td>
<td>Male</td>
</tr>
<tr>
<td>Title</td>
<td>Security Thief</td>
</tr>
<tr>
<td>Address</td>
<td>456 Running Water</td>
</tr>
<tr>
<td>City</td>
<td>Kenner</td>
</tr>
<tr>
<td>State</td>
<td>LA</td>
</tr>
</tbody>
</table>
F.  JDBC HTML  STYLESHEET  XML SOURCE CODE

<?xml version="1.0" encoding="UTF-8"?>
<!-- developed with XML Spy v4.0 U (http://www.xmlspy.com) by Clifton Williams (Naval Postgraduate School) -->
<xsl:stylesheet version="1.0" xmlns:xsl="http://www.w3.org/1999/XSL/Transform"
xmns:fo="http://www.w3.org/1999/XSL/Format">
<xsl:template match="/">
<xsl:apply-templates/>
</xsl:template>
<xsl:template match="resultset">
<html>
<head>
<title>
This is an Database to XML Servlet in HTML
</title>
</head>
<body>
<h1 align="center">
Clif's XML to HTML Database example
</h1>
<table border="1" cellspacing="0" cellpadding="5" align="center">
<xsl:apply-templates select="metadata"/>
<xsl:apply-templates select="//resultset/records"/>
</table>
</body>
</html>
</xsl:template>
<xsl:template match="metadata">
<tr bgcolor="#FFD700">
<xsl:apply-templates/>
</tr>
</xsl:template>
</xsl:stylesheet>
Cocoon Web-publishing framework

Database Connection and Query page

```html
<form action="/jdbcxml/Servlet/jdbc.xml.JDBCHTML" method="POST">
<table border="0">
<tr>
<td align="right"><font face="Arial">JDBC DRIVER:</font></td>
<td><font><input type="text" size="50" name="driver" value="sun.jdbc.odbc.JdbcOdbcDriver" /></font></td>
</tr>
<tr>
<td align="right"><font face="Arial">JDBC URL: </font></td>
<td><font><input type="text" size="50" name="jdbcurl" value="jdbc:odbc:clif" /></font></td>
</tr>
<tr>
<td align="right"><font face="Arial">UserID: </font></td>
<td><font><input type="text" size="50" name="uid" /></font></td>
</tr>
<tr>
<td align="right"><font face="Arial">Password: </font></td>
<td><font><input type="text" size="50" name="pwd" /></font></td>
</tr>
<tr>
<td align="right"><font face="Arial">SQL Statement: </font></td>
<td><textarea name="sql" row="10" cols="50" rows="10">Select *
From Patient</textarea></td>
</tr>
</table>
</form>
```
<tr>
<td align="right"><input type="Submit" /></td>
<td> </td>
</tr>
</table>
</form>
</body>
</html>
APPENDIX F. WEB PUBLISHING FRAMEWORK’S SOURCE CODE USING COCOON FOR GENERIC DATABASE ACCESS

A. INTRODUCTION

The Web Publishing Framework prototype site uses XML and Java technologies in the Web site design. Section B is the ESQL Schema. Section C is GenericESQL Stylesheet.

B. ESQL SCHEMA

```xml
<?xml version="1.0"?>
<!-- edited with XML Spy v4.0 U (http://www.xmlspy.com) by Clifton Williams (Naval Postgraduate School) -->
<!DOCTYPE schema SYSTEM "../../xdocs/dtd/XMLSchema.dtd">
<schema xmlns="http://www.w3.org/2000/10/XMLSchema"
    xmlns:esql="http://apache.org/cocoon/SQL/v2">
  <element name="esql:ref">
    <annotation>
      <documentation>Opens a new database connection.</documentation>
    </annotation>
    <complexType>
      <sequence>
        <choice>
          <!-- not schema strings - xsp strings -->
          <element name="esql:driver" type="string">
            <annotation>
              <documentation>The name of the driver to use</documentation>
            </annotation>
          </element>
          <element name="esql:dburl" type="string">
            <annotation>
              <documentation>The URL of the database</documentation>
            </annotation>
          </element>
          <element name="esql:username" type="string" minOccurs="0" maxOccurs="1">
            <annotation>
              <documentation>The database user's name</documentation>
            </annotation>
          </element>
          <element name="esql:password" type="string" minOccurs="0" maxOccurs="1">
            <annotation>
              <documentation>The database user's password</documentation>
            </annotation>
          </element>
        </choice>
      </sequence>
    </complexType>
  </element>
</schema>
```
The database user's password

The name of the database pool

Executes a query on the database

The query to execute

A parameter for a prepared statement

This element's children are instantiated in the result tree when the query returns a resultset

This element's children are instantiated in the result tree for each row in the resultset
<complexType mixed="true">
    <sequence>
        <choice>
            <any namespace="##other" minOccurs="0" maxOccurs="unbounded" processContents="lax"/>
            <element name="esql:get-columns" minOccurs="0" maxOccurs="unbounded">
                <annotation>
                    <documentation>Returns a sequence of elements whose names are the current row's column names, and whose values are the current row's column values</documentation>
                </annotation>
                <element name="esql:encoding" minOccurs="0" maxOccurs="1">
                    <annotation>
                        <documentation>The encoding used for this column, specified as a Java encoding name.</documentation>
                    </annotation>
                </element>
            </element>
            <element name="esql:get-string" minOccurs="0" maxOccurs="unbounded" type="EsqlColumnFunction">
                <annotation>
                    <documentation>Returns the value of the given column in the current row as a string</documentation>
                </annotation>
                <element name="esql:encoding" minOccurs="0" maxOccurs="1">
                    <annotation>
                        <documentation>The encoding used for this column, specified as a Java encoding name.</documentation>
                    </annotation>
                </element>
            </element>
            <element name="esql:get-date" minOccurs="0" maxOccurs="unbounded" type="EsqlFormattedColumnFunction">
                <annotation>
                    <documentation>Returns the value of the given column in the current row as a date</documentation>
                </annotation>
            </element>
            <element name="esql:get-time" minOccurs="0" maxOccurs="unbounded">
                <annotation>
                    <documentation>Returns the value of the given column in the current row as a time</documentation>
                </annotation>
            </element>
        </choice>
    </sequence>
</complexType>
<element name="esql:get-timestamp" minOccurs="0" maxOccurs="unbounded">
  <annotation>
    <documentation>Returns the value of the given column in the current row as a timestamp</documentation>
  </annotation>
</element>

<element name="esql:get-boolean" minOccurs="0" maxOccurs="unbounded">
  <annotation>
    <documentation>Returns the value of the given column in the current row as a boolean</documentation>
  </annotation>
</element>

<element name="esql:get-double" minOccurs="0" maxOccurs="unbounded">
  <annotation>
    <documentation>Returns the value of the given column in the current row as a double</documentation>
  </annotation>
</element>

<element name="esql:get-float" minOccurs="0" maxOccurs="unbounded">
  <annotation>
    <documentation>Returns the value of the given column in the current row as a float</documentation>
  </annotation>
</element>

<element name="esql:get-int" minOccurs="0" maxOccurs="unbounded">
  <annotation>
    <documentation>Returns the value of the given column in the current row as a int</documentation>
  </annotation>
</element>

<element name="esql:get-long" minOccurs="0" maxOccurs="unbounded">
  <annotation>
    <documentation>Returns the value of the given column in the current row as a long</documentation>
  </annotation>
</element>

<element name="esql:get-short" minOccurs="0" maxOccurs="unbounded">
  <annotation>
    <documentation>Returns the value of the given column in the current row as a short</documentation>
  </annotation>
</element>

<element name="esql:get-xml" minOccur...
<complexType>
  <sequence>
    <element name="esql:get-column-name" minOccurs="0" maxOccurs="unbounded">
      <annotation>
        <documentation>Returns the name of the given column in the current row</documentation>
      </annotation>
    </element>
    <element name="esql:get-column-label" minOccurs="0" maxOccurs="unbounded">
      <annotation>
        <documentation>Returns the label of the given column in the current row</documentation>
      </annotation>
    </element>
    <element name="esql:get-column-type-name" minOccurs="0" maxOccurs="unbounded">
      <annotation>
        <documentation>Returns the type name of the given column in the current row</documentation>
      </annotation>
    </element>
    <element name="esql:esql:get-column-type-name" minOccurs="0" maxOccurs="unbounded">
      <annotation>
        <documentation>Returns the type name of the given column in the current row</documentation>
      </annotation>
    </element>
    <element name="esql:no-results" minOccurs="0" maxOccurs="1">
      <annotation>
        <documentation>This element's children are instantiated in the result tree for each row in the resultset</documentation>
      </annotation>
    </element>
    <element name="esql:esql:update-results" minOccurs="0" maxOccurs="1">
      <annotation>
        <documentation>Updates the result set with the given row</documentation>
      </annotation>
    </element>
  </sequence>
</complexType>
<annotation>
  <documentation>This element's children are instantiated in the result tree if the query returns a number of rows</documentation>
</annotation>
</element>
<element name="esql:esql-error-results" minOccurs="0" maxOccurs="1">
  <annotation>
    <documentation>This element's children are instantiated in the result tree if the query results in a database error. If this element does not exist, the error is passed on to the xsp layer. If it does exist, the error is caught here unless passed on explicitly.</documentation>
</annotation>
</element>
</sequence>
</complexType>
<complexType name="EsqlColumnFunction">
  <annotation>
    <documentation>The given column is indicated by the column attribute. If the attribute's value is an integer, it is treated as the index of the column in the row, otherwise its value is treated as the name of the column.</documentation>
  </annotation>
  <attribute name="column" type="string"/>
</complexType>
<complexType name="EsqlFormattedColumnFunction">
  <annotation>
    <documentation>The value of the format attribute can used by some column value functions (e.g. date, real) as a template for formatting the column value. This is necessarily implementation dependent.</documentation>
  </annotation>
  <complexContent>
    <extension base="EsqlColumnFunction">
      <attribute name="format" type="string"/>
    </extension>
  </complexContent>
</complexType>
</schema>
C. GENERICESQL STYLESHEET

```xml
<?xml version="1.0"?>
<!-- developed using XML Spy v4.0 U (http://www.xmlspy.com) by Clifton Williams (Naval Postgraduate School) -->
<xsl:stylesheet
    xmlns:xsl="http://www.w3.org/1999/XSL/Transform"
    version="1.0"
    />
<xsl:template match="/page">
<html>
<head>
<title>
This is Clif's generic Database connection using Cocoon
</title>
</head>
<body>
<p><img border="0" src="http://www.xmlking.org/images/NPS_r01_c1.gif" alt="NPS Header" width="969" height="90" /></p>
<p align="center"><img border="0" src="http://www.xmlking.org/images/Flag.gif" alt="American Flag" align="left" /> <img border="0" src="http://www.xmlking.org/images/HerrmannHallHomePage.jpg" alt="Herrmann Hall" width="266" height="183" /></p>
<p>
<xsl:value-of select="header"/>
</p>
<table border="1" cellspacing="0" cellpadding="5" align="center">
<tr bgcolor="#FFD700">
<td><b>PatientID</b></td>
<td><b>FName</b></td>
<td><b>LName</b></td>
<td><b>Email</b></td>
<td><b>Gender</b></td>
<td><b>Title</b></td>
<td><b>Address</b></td>
<td><b>City</b></td>
<td><b>State</b></td>
<td><b>Postal Code</b></td>
<td><b>Country</b></td>
<td><b>Home Phone</b></td>
</tr>
</table>
</body>
</html>
```
<table>
<thead>
<tr>
<th>PatientID</th>
<th>FName</th>
<th>LName</th>
<th>Email</th>
<th>gender</th>
<th>Title</th>
<th>Address</th>
<th>City</th>
<th>State</th>
<th>PostalCode</th>
<th>Country</th>
<th>HomePhone</th>
</tr>
</thead>
</table>
APPENDIX G. WEB PUBLISHING FRAMEWORK’S SOURCE CODE USING COCOON FOR X3D ENVIRONMENTS

A. INTRODUCTION

The Web Publishing Framework prototype site uses XML and Java technologies in the Web site is design. Section B is the X3DCocoon Servlet. Section C is the X3DVRML.XSL used by the Framework to convert Coc”XMLfile”.XML to VRML. Section D is the X3D XML file HelloWorld.XML. Section E is the X3DtoHTML.XSL used by the X3dCocoon Servlet to convert .XML to HTML. Section F is the X3DtoHTML output Helloworld.HTML. Section G is the XML output CocHelloWorld.xml used by the Framework, which is converted to VRML. Section H is the XML output CocKelpForest.xml used by the Framework, which is converted to VRML. Section I is the XML output CocAmphibiousRaid.xml used by the Framework which is converted to VRML. Section J is the XHTML X3DCocoon Selection source code. Section K is only a small part of X3DtoVrml97.XSL used by the X3dCocoon Servlet to convert .XML to VRML. The Full version of the X3DtoVrml97.XSL stylesheet can be obtained at [X3D].

B. X3D COCOON CLASS

```java
package jdbc.xml;

import javax.servlet.*;
import javax.servlet.http.*;
import java.io.*;
import org.xml.sax.SAXException;
import org.apache.xalan.xslt.*;

/**
 * Title: X3dCocoon CLASS
 */
```
public class X3dCocoon extends HttpServlet {

private String qryPath;

private String xmlFile;

private String xslFile;

private final int INCOMPLETE_DATA = 0;

private final int CANNOT_ACCESS = 1;

private final int DATA_NOT_FOUND = 2;

private HttpServletResponse res;

private HttpServletRequest req;

private PrintWriter out;

private Writer xmlout;

/**
public void doGet(HttpServletRequest req, HttpServletResponse res) throws IOException, ServletException {
    this.res = res;
    this.req = req;
    out = res.getWriter();

    boolean badData = false;

    //get the user parameter
    xmlFile = req.getParameter("xmlInput");
    xslFile = req.getParameter("xsltInput");

    //checks to see if any entry has been made
    if (xmlFile.length() == 0 ||
        xslFile.length() == 0) {
        //Sets the Content Type
        res.setContentType("text/html");
        processError(INCOMPLETE_DATA);
    } //end if
    else {
        String xsltSystemId = new File("C:/jakarta-tomcat-3.2.3/webapps/jdbcxml/WEB-INF/classes/jdbc/xml/" + xslFile + ").toURL().toExternalForm();
        //checks path
        if (req.getPathInfo() == null) {
            qryPath = getServletConfig().getServletContext().getRealPath(req.getServletPath());
        } //end if
else
{
    qryPath = req.getPathTranslated();
}//end else
String output = new File("C:/jakarta-tomcat-3.2.3/webapps/jdbcxml/WEB-INF/classes/jdbc/xml/"+ xmlFile + ").toURL().toExternalForm();
try
{
    //process the xml document with xsl document generates output for browser
    XSLTProcessor proc = XSLTProcessorFactory.getProcessor();
    proc.process(new XSLTInputSource((output)),
            new XSLTInputSource(xsltSystemId), new XSLTResultTarget(out));
}//end try
catch(SAXException se)
{
    throw new ServletException(se);
}//end catch
//checks the stylesheet name and applies the correct Content type
if (xslFile.equalsIgnoreCase("X3dVRML.xsl"))
{
   // begin anchor tag set
   res.setContentType("model/vrml");
}  // end if
else if(xslFile.equalsIgnoreCase("X3dCocoon.xsl"))
{
    //This is used to generate a cocoon wrapper to run in the cocoon framework
    try{
       //generates a Cocoon wrapper the the web publishing framework
       FileWriter fileOut = new FileWriter("C:/jakarta-tomcat-3.2.3/webapps/cocoon/samples/vrml/thesis/Coc"+xmlFile,\false);
       BufferedWriter bw = new BufferedWriter(fileOut);
       bw.write("<\?xml-stylesheet href="x3dvrml.xsl" type="text/xsl"?>");
       bw.write("<\?cocoon-process type="xslt"?>");
       bw.write("<page>\r\n");
       bw.write("<title>\r\n"+ xmlFile +" with Cocoon <title>\r\n");

   

}
bw.write("<vrml>\r\n");
bw.close();

// appends the vrml output to the file
fileOut = new FileWriter("C:/jakarta-tomcat-3.2.3/webapps/cocoon/samples/vrml/thesis/Coc"+xmlFile, true);
try
{
    // process the xml document with xsl document generates output for browser
    xslFile = "X3DToVrml97.xsl";
    xsltSystemId = new File("C:/jakarta-tomcat-3.2.3/webapps/jdbcxml/WEB-INF/classes/jdbc/xml/"+ xslFile + "").toURL().toExternalForm();
    XSLTProcessor proc = XSLTProcessorFactory.getProcessor();
    proc.process(new XSLTInputSource((output)),
                 new XSLTInputSource(xsltSystemId), new XSLTResultTarget(fileOut));
} // end try
catch (SAXException se)
{
    throw new ServletException(se);
} // end catch
bw.close();

// Stores the xml file in the cocoon web publishing work appends to file
fileOut = new FileWriter("C:/jakarta-tomcat-3.2.3/webapps/cocoon/samples/vrml/thesis/Coc"+xmlFile, true);
bw = new BufferedWriter(fileOut);
bw.write("<vrml>\r\n");
bw.write("</page>\r\n");
bw.close();
} // end try
catch (FileNotFoundException fileEx)
{
    errorMsg(fileEx.getMessage());
    processError(CANNOT_ACCESS);
} // end catch
catch (IOException IOex)
```java
    {  
        errorMsg(IOex.getMessage());  
        processError( CANNOT_ACCESS);  
    }  
}  
// end catch  
}  
// end elseif  
else  
{  
    //default setting to content type  
    res.setContentType("text/html");  
}  
//end else  
}  
//end else  
}  
//end method

/**  
 *    Process the Http servlet request and response    
 */  
public void doPost(HttpServletRequest req, HttpServletResponse res)  
    throws IOException, ServletException  
{  
    doGet(req,res);  
}  
//end method

/**  
 * processes Errors received in verify User and generate an DHTML in response  
 */  
private void processError( int errorType )  
{  
    String errorMsg = ";";  
    switch ( errorType ) {  
        case INCOMPLETE_DATA:  
            errorMsg = "Please provide data to all fields";  
    }
```
break;

case CANNOT_ACCESS:
    errorMsg = "Error: Writing access file.\n" + errorMsg;
break;

case DATA_NOT_FOUND:
    errorMsg = "No match was found. Please try again";
break;
} //end switch

//Generate Error the title
out.println("<html><head><title>");
out.println("Error Has Occurred" );
out.println("</title></head>" );

//Generates the body
out.println("<body><h1>");
out.println("Cannot validate you for the following reason: " );
out.println("</h1> " );
out.println("<h3>");
out.println(errorMsg );
out.println("<br></br>");

//links to try to login again HTML
out.println("<p><h3>");
out.println("<form method=" POST" action="http://www.xmlking.org/X3dSelection.html" >"");
out.println("<left><br>Try Again" );
out.println("<input type ="submit" value="Try Again" name="B1"style="background-color: #006666; color: #FFFFFF; border-style: ridge; border-color: #006666"">" );
out.println("</br></left></form>" );
out.println("</p></h3>" );
out.println("</body>");
out.close();
} //end process error method
/**
 * error generating message section
 */

public void errorMsg(String error){

out.println("<P>The following error has occurred: /n");
out.println(error);
out.println("</p>");

try
{
    wait();
} //end try
catch(Exception e){
} //end catch
} //end method
} //end class

C.  X3DVRML.XSL

<?xml version="1.0"?>
<!-written with XML Spy v4.0 U (http://www.xmlspy.com) by Clifton Williams (Naval Postgraduate School) -->
<?xml-stylesheet type="text/xsl" href="C:\jakarta-tomcat-3.2.3\webapps\cocoon\samples\vrml\X3Dvrml.xsl"?>
<xsl:stylesheet version="1.0" xmlns:xsl="http://www.w3.org/XSL/Transform/1.0"
D. HELLOWORLD.XML

<?xml version="1.0" encoding="utf-8"?>
<!-- edited with XML Spy v4.0 U (http://www.xmlspy.com) by Clifton Williams (Naval Postgraduate School) -->

<!ENTITY % BaseProfile "INCLUDE">
<?xml-stylesheet type="text/xsl" href="X3dHTML.xsl"?>
<?xml-stylesheet type="text/xsl" href="X3dVRML.xsl"?>
<X3D>
  <head>
    <meta content="HelloWorld.xml" name="filename"/>
    <meta content="Simple X3D example" name="description"/>
    <meta content="30 October 2000" name="revised"/>
    <meta content="Don Brutzman" name="author"/>
    <meta content="http://www.web3D.org/TaskGroups/x3d/translation/examples/HelloWorld.xml" name="url"/>
    <meta content="X3D-Edit,  http://www.web3D.org/TaskGroups/x3d/translation/README.X3D-Edit.html" name="generator"/>
  </head>
  <Scene>
    <!--Example scene to illustrate X3D tags and attributes.-->
    <Group>
      <Viewpoint description="XML Presentation!" orientation="0 1 0 1.57" position="9 -1 0"/>
      <NavigationInfo type="EXAMINE ANY"/>
      <Shape>
        <Sphere DEF="S"/>
        <Appearance>
          <ImageTexture url="earth-topo.png earth-topo-small.gif C:\www.web3D.org\TaskGroups\x3d\translation\examples\earth-topo.png earth-topo-small.gif"/>
        </Appearance>
      </Shape>
      <Transform rotation="0 1 0 1.57" translation="0 -2 1.25">
<Shape>
  <Text string="&amp;#34;XML Presentation!&amp;#34;"/>
  <Appearance>
    <Material diffuseColor="0.1 0.5 1"/>
  </Appearance>
</Shape>
</Transform>
</Group>
</Scene>
</X3D>

E.  X3DTOHTML.XSL

<?xml version='1.0'?>
<xsl:stylesheet xmlns:xsl="http://www.w3.org/1999/XSL/Transform"
    xmlns:saxon="http://icl.com/saxon" saxon:trace="yes"
    version="1.0">
    <!-- XSL namespaces are in transition! Tools are slow to catch up. 
        *** Edit the topmost stylesheet tag on line 2 of this file to match the xmlns namespace
        URI for your XSL tool. ***
        W3C:   <xsl:stylesheet xmlns:xsl='http://www.w3.org/1999/XSL/Transform'>
        Saxon: <xsl:stylesheet xmlns:xsl='http://www.w3.org/1999/XSL/Transform'>
        IBM XSLEditor: <xsl:stylesheet xmlns:xsl='http://www.w3.org/XSL/Transform/1.0'>
        IE 5:   <xsl:stylesheet xmlns:xsl='http://www.w3.org/TR/WD-xsl'>
        XT:    <xsl:stylesheet xmlns:xsl='http://www.w3.org/XSL/Transform'>
    -->

    <!--

    <head>
    <meta name="filename" content="X3dToHtml.xsl" />
    <meta name="author" content="Don Brutzman" />
    <meta name="revised" content="3 July 2001" />

    197
Recommended tool:

- SAXON XML Toolkit (and Instant Saxon) from Michael Kay of ICL, http://users.iclway.co.uk/mhkay/saxon

  - Can also be used with Apache server

<!-- Problems and bugs: -->

- autocorrection of String, array field delimiters in ProtoInstances (GeoVrmlExample1)

<!-- omit-xml-declaration="no" -->
<!-- &lt;!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.0//EN" http://www.w3.org/TR/REC-html40/strict.dtd&gt;--&gt;
&lt;xsl:processing-instruction name="cocoon-format" type="text/xsl"&gt;--&gt;

&lt;xsl:text&gt;&lt;html&gt;&#10;&lt;head&gt;&#10;&lt;title&gt;
&lt;xsl:variable name="fileName" select="/head/meta[@name='filename']/@content" /&gt;&lt;xsl:choose&gt;
&lt;xsl:when test="$fileName and $fileName!='*enter filename here*' ">
   &lt;xsl:value-of select="/head/meta[@name='filename']/@content"/&gt;
 &lt;/xsl:when&gt;
 &lt;xsl:otherwise&gt;&lt;xsl:text&gt; X3dToHtml &lt;/xsl:text&gt;&lt;/xsl:otherwise&gt;
 &lt;/xsl:choose&gt;
&lt;xsl:text&gt;&lt;/title&gt;&#10;&lt;/head&gt;&#10;&lt;/body&gt;&#10;&lt;/html&gt;--&gt;

&lt;xsl:variable name="wrapped" select="/*[local-name()='appearance' or local-name()='children' or local-name()='choice' or local-name()='color' or local-name()='coord' or local-name()='fontStyle' or local-name()='geometry' or local-name()='material' or local-name()='normal' or local-name()='source' or local-name()='level' or local-name()='texCoord' or local-name()='texture' or local-name()='textureTransform']" /&gt;&lt;xsl:choose&gt;
&lt;xsl:when test="$wrapped"&gt;
 &lt;xsl:text&gt;&lt;?xml version="1.0" encoding="UTF-8"?&gt;&lt;xsl:text&gt;

http://www.web3D.org/TaskGroups/x3d/translation/X3dToHtml.xsl?&gt;&amp;gt;&lt;/xsl:text&gt;

&lt;xsl:choose&gt;
&lt;xsl:when test="$wrapped"&gt;
 &lt;xsl:text&gt;&lt;DOCTYPE X3D PUBLIC "http://www.web3D.org/TaskGroups/x3d/translation/x3d-compromise.dtd"&gt;--&gt;

199
</xsl:template>
<!-- ****** recurse through each of the attributes ****** -->
<xsl:template match="@*">
<!-- eliminate default attribute values, otherwise they will all appear in output -->
<!-- this block is used identically in X3dToVrml97.xsl X3dToHtml.xsl X3dUnwrap.xsl and
X3dWrap.xsl -->
<!-check
values
with/without
.0
suffix
since
these
are
string
checks
and
autogenerated/DOM output might have either -->
<!-- do not check ProtoInstances or natively defined nodes, since they might have
different user-defined defaults -->
<!-- tool-bug workaround: split big boolean queries into pieces to avoid overloading the
Xalan/lotusxml query buffer -->
<xsl:variable name="notImplicitEvent"
select="not(local-name(..)='AudioClip' and (local-name()='duration'
or
localname()='isActive')) and
not(contains(local-name(..),'Interpolator')
and
(local-name()='fraction'
or
localname()='value')) and
not(local-name(..)='Background' and (local-name()='bind' or local-name()='bindTime' or
local-name()='isBound')) and
not(local-name(..)='CylinderSensor' and (local-name()='isActive'
or
localname()='rotation' or local-name()='trackPoint')) and
not(local-name(..)='Fog'
and (local-name()='bind' or local-name()='bindTime' or localname()='isBound')) and
not(local-name(..)='IndexedLineSet' and local-name()='lineWidth') and
not(local-name(..)='NavigationInfo' and (local-name()='bind' or local-name()='bindTime'
or local-name()='isBound')) and
not(local-name(..)='PointSet' and
local-name()='pointSize') and
not(local-name(..)='PlaneSensor' and (local-name()='isActive'
or
localname()='translation' or local-name()='trackPoint')) and
not(local-name(..)='ProximitySensor'
and
(local-name()='isActive'
or
localname()='position' or local-name()='orientation' or
local-name()='enterTime' or local-name()='exitTime')) and

203


not(local-name(.)='SphereSensor' and (local-name()='isActive' or local-name()='trackPoint')) and
not(local-name(.)='TimeSensor' and (local-name()='isActive' or local-name()='cycleTime' or local-name()='fraction' or local-name()='time')) and
not(local-name(.)='TouchSensor' and (local-name()='isActive' or local-name()='isOver' or local-name()='hitNormal' or local-name()='touchTime' or local-name()='hitPoint' or local-name()='hitTexCoord')) and
not(local-name(.)='Viewpoint' and (local-name()='bind' or local-name()='bindTime' or local-name()='isBound' or local-name()='examine')) />

<xsl:variable name="notDefaultFieldValue1" select="not( local-name()='bboxCenter' and (.='0 0 0' or .='0.0 0.0 0.0')) and
not( local-name()='bboxSize' and (.='-1 -1 -1' or .='-1.0 -1.0 -1.0')) and
not( local-name(.)='AudioClip' and ((local-name()='loop' and .='false') or (local-name()='pitch' and (.='1' or .='1.0')) or (local-name()='startTime' and (.='0' or .='0.0')) or (local-name()='stopTime' and (.='0 0 0' or .='0.0 0.0 0.0')))) and
not( local-name(.)='Background' and local-name()='skyColor' and (.='0 0 0' or .='0.0 0.0 0.0')) and
not( local-name(.)='Billboard' and local-name()='axisOfRotation' and (.='0 1 0' or .='0.0 1.0 0.0')) and
not( local-name(.)='Box' and local-name()='size' and (.='2 2 2' or .='2.0 2.0 2.0')) and
not( local-name(.)='Collision' and local-name()='collide' and .='true') and
not( local-name(.)='Cone' and ((local-name()='bottomRadius' and (.='1' or .='1.0')) or (local-name()='height' and (.='2' or .='2.0')) or (local-name()='side' and .='true') or (local-name()='bottom' and .='true')))) and
not( local-name(.)='Cylinder' and ((local-name()='height' and (.='2' or .='2.0')) or (local-name()='radius' and (.='1' or .='1.0')) or (local-name()='bottom' and .='true')) or
<xsl:variable name="notDefaultFieldValue4" select="not( local-name(.)='MovieTexture' and ((local-name()='loop' and .='false') or (local-name()='speed' and (.='1' or .='1.0')) or (local-name()='startTime' and (.='0' or .='0.0')) or (local-name()='stopTime' and (.='0' or .='0.0')) or (local-name()='repeatS' and .='true') or (local-name()='repeatT' and .='true')) and not( local-name(.)='NavigationInfo' and ((local-name()='avatarSize' and .='0.25 1.6 0.75') or (local-name()='headlight' and .='true') or (local-name()='speed' and (.='1' or .='1.0')) or (local-name()='visibilityLimit' and (.='0' or .='0.0'))) and not( local-name(.)='PixelTexture' and ((local-name()='repeatS' and .='true') or (local-name()='repeatT' and .='true') or (local-name()='image' and (.='0 0 0' or .='0.0 0.0 0.0'))) and not( local-name(.)='PlaneSensor' and ((local-name()='autoOffset' and .='true') or (local-name()='enabled' and .='true') or (local-name()='maxPosition' and (.='1 -1 -1' or .='1.0 -1.0')) or (local-name()='minPosition' and (.='0 0 0' or .='0.0 0.0 0.0')) or (local-name()='offset' and (.='0 0 0' or .='0.0 0.0 0.0'))) and not( local-name(.)='PointLight' and ((local-name()='ambientIntensity' and (.='0' or .='0.0')) or (local-name()='attenuation' and (.='1 0 0' or .='1.0 0.0 0.0')) or (local-name()='color' and (.='1 1 1' or .='1.0 1.0 1.0')) or (local-name()='intensity' and (.='1' or .='1.0')) or (local-name()='location' and (.='0 0 0' or .='0.0 0.0 0.0')) or (local-name()='on' and .='true') or (local-name()='radius' and (.='100' or .='100.0'))))" />
<xsl:variable name="notDefaultFieldValue5"
    select="not( local-name(..)='ProximitySensor' and
            (local-name()='center' and (.='0 0 0' or .='0.0 0.0 0.0')) or
            (local-name()='size' and (.='0 0 0' or .='0.0 0.0 0.0')) or
            (local-name()='enabled' and .='true')) and
        not( local-name(..)='Script' and ((local-name()='directOutput' and .='false') or
            (local-name()='mustEvaluate' and .='false'))) and
        not( local-name(..)='Sound' and ((local-name()='direction' and (.='0 0 1' or .='0.0 0.0 1.0')) or
            (local-name()='intensity' and (.='1' or .='1.0')) or
            (local-name()='location' and (.='0 0 0' or .='0.0 0.0 0.0')) or
            (local-name()='priority' and (.='0' or .='0.0')) or
            (local-name()='maxBack' and (.='10' or .='10.0')) or
            (local-name()='maxFront' and (.='10' or .='10.0')) or
            (local-name()='minBack' and (.='1' or .='1.0')) or
            (local-name()='minFront' and (.='1' or .='1.0')) or
            (local-name()='spatialize' and .='true')))) and
        not( local-name(..)='Sphere' and local-name()='radius' and (.='1' or .='1.0')) and
        not( local-name(..)='SphereSensor' and
            (local-name()='autoOffset' and .='true') or
            (local-name()='enabled' and .='true') or
            (local-name()='offset' and (.='0 1 0 0' or .='0.0 1.0 0.0 0.0')))" />

<xsl:variable name="notDefaultFieldValue6"
    select="not( parent::SpotLight and
            (local-name()='ambientIntensity' and (.='0' or .='0.0')) or
            (local-name()='attenuation' and (.='1 0 0' or .='1.0 0.0 0.0')) or
            (local-name()='beamwidth' and .='1.570796') or
            (local-name()='color' and (.='1 1 1' or .='1.0 1.0 1.0')) or
            (local-name()='cutOffAngle' and .='0.785398') or
            (local-name()='direction' and (.='0 0 -1' or .='0.0 0.0 -1.0')) or
            (local-name()='intensity' and (.='1' or .='1.0')) or
            (local-name()='location' and (.='0 0 0' or .='0.0 0.0 0.0')) or
            (local-name()='on' and .='true') or
            (local-name()='radius' and (.='100' or .='100.0')))" />

208
not( local-name(.)='Switch' and local-name(.)='whichChoice' and (.='-1' or .='-1.0')) and
not( local-name(.)='Text' and local-name(.)='maxExtent' and (.='0' or .='0.0')) and
not( local-name(.)='TextureTransform' and
  ((local-name(.)='center' and (.='0 0' or .='0.0 0.0')) or
  (local-name(.)='rotation' and (.='0' or .='0.0')) or
  (local-name(.)='scale' and (.='1 1' or .='1.0 1.0')) or
  (local-name(.)='translation' and (.='0 0' or .='0.0 0.0'))) and
not( local-name(.)='Switch' and local-name(.)='whichChoice' and (.='-1' or .='-1.0')) />

<xsl:variable name="notDefaultFieldValue7" select="not( local-name(.)='TimeSensor' and
  ((local-name(.)='cycleInterval' and (.='1' or .='1.0')) or
  (local-name(.)='enabled' and .='true') or
  (local-name(.)='startTime' and (.='0' or .='0.0')) or
  (local-name(.)='stopTime' and (.='0' or .='0.0')) or
  (local-name(.)='loop' and .='false')) and
not( local-name(.)='TouchSensor' and
  local-name(.)='enabled' and .='true') and
not( local-name(.)='Transform' and
  ((local-name(.)='center' and (.='0 0 0' or .='0.0 0.0 0.0')) or
  (local-name(.)='rotation' and (.='0 0 1 0' or .='0.0 0.0 1.0 0.0')) or
  (local-name(.)='scale' and (.='1 1 1' or .='1.0 1.0 1.0')) or
  (local-name(.)='scaleOrientation' and (.='0 0 1 0' or .='0.0 0.0 1.0 0.0')) or
  (local-name(.)='translation' and (.='0 0 0' or .='0.0 0.0 0.0'))) and
not( local-name(.)='Viewpoint' and
  ((local-name(.)='fieldOfView' and .='0.785398') or
  (local-name(.)='jump' and .='true') or
  (local-name(.)='orientation' and (.='0 0 1 0' or .='0.0 0.0 1.0 0.0')) or
  (local-name(.)='position' and (.='0 0 10' or .='0.0 0.0 10.0'))) and
not( local-name(.)='VisibilitySensor' and
  ((local-name(.)='center' and (.='0 0 0' or .='0.0 0.0 0.0')) or
  (local-name(.)='enabled' and .='true') or
  (local-name(.)='size' and (.='0 0 0' or .='0.0 0.0 0.0'))))" />

209
$notDefaultFieldValue1 and
$notDefaultFieldValue2 and
$notDefaultFieldValue3 and
$notDefaultFieldValue4 and
$notDefaultFieldValue5 and
$notDefaultFieldValue6 and
$notDefaultFieldValue7 and

$notDefaultHAnim and
$notFieldSpace">
  <!-- and not((local-name(../..)='Script' and local-name(..)='field') and (local-name()='xml:space' or local-name()='space')) -->
  <!-- valid field found by the preceding checks, now output accordingly -->
  <!-- single attributes can stay on same line, skip line otherwise -->
  <!-- problem: appears to be counting default attributes in addition to user-defined attributes... -->
  <xsl:if test="(count (../@*) > 2) or ((count (../@*) = 2) and (string-length(../@*[1]) + string-length(../@*[2]) &gt; 72))">
    <xsl:text>&#10;</xsl:text>
  </xsl:if>
  <xsl:text>&lt;font color=&quot;GREEN&quot;&gt;</xsl:text>
  <!-- output actual attribute value. try to break MFStrings into multiple lines. -->
  <xsl:value-of select="local-name()"/>
  <xsl:text>&lt;/font&gt;&lt;/xsl:text>
</xsl:if>
<xsl:text> &lt;/xsl:text>
  </xsl:text> &lt;font color=&quot;GREEN&quot;&gt;&lt;/font&gt;&lt;B&gt;=&apos;&lt;/B&gt;&lt;/xsl:text>
</xsl:choose>
<!-- print out urls containing javascript source without further ado -->
  <xsl:when test="(local-name()='url' and starts-with(normalize-space(.),'javascript:'))">
    <xsl:text>&lt;PRE&gt;</xsl:text>
    <xsl:value-of select="." disable-output-escaping="yes"/>
    <xsl:text>&lt;/PRE&gt;</xsl:text>
  </xsl:when>
  <!-- make single url reference into actual A HREF= link -->
  <xsl:when test="(local-name()='url' or contains(local-name(), 'Url') or (local-name(..)='meta' and (./@name='url' or ./@name='filename' or ./@name='reference' or ./@name='copyright' or ./@name='drawing' or ./@name='image' or ./@name='movie' or ...) and (string-length(../@*) &gt; 72))">
    <xsl:choose>
      <xsl:when test="(local-name()='url' and starts-with(normalize-space(.),'javascript:'))">
        <xsl:text>&lt;PRE&gt;</xsl:text>
        <xsl:value-of select="." disable-output-escaping="yes"/>
        <xsl:text>&lt;/PRE&gt;</xsl:text>
      </xsl:when>
      <!-- single attributes can stay on same line, skip line otherwise -->
      <!-- problem: appears to be counting default attributes in addition to user-defined attributes... -->
      <xsl:if test="(count (../@*) &gt; 2) or ((count (../@*) = 2) and (string-length(../@*[1]) + string-length(../@*[2]) &gt; 72))">
        <xsl:text>&lt;PRE&gt;</xsl:text>
        <xsl:choose>
          <xsl:when test="(local-name()='url' and starts-with(normalize-space(.),'javascript:'))">
            <xsl:text>&lt;PRE&gt;</xsl:text>
            <xsl:value-of select="." disable-output-escaping="yes"/>
            <xsl:text>&lt;/PRE&gt;</xsl:text>
          </xsl:when>
          <!-- make single url reference into actual A HREF= link -->
          <xsl:when test="(local-name()='url' or contains(local-name(), 'Url') or (local-name(..)='meta' and (./@name='url' or ./@name='filename' or ./@name='reference' or ...) and (string-length(../@*) &gt; 72))">
            <xsl:choose>
              <xsl:when test="(local-name()='url' and starts-with(normalize-space(.),'javascript:'))">
                <xsl:text>&lt;PRE&gt;</xsl:text>
                <xsl:value-of select="." disable-output-escaping="yes"/>
                <xsl:text>&lt;/PRE&gt;</xsl:text>
              </xsl:when>
              <!-- single attributes can stay on same line, skip line otherwise -->
              <!-- problem: appears to be counting default attributes in addition to user-defined attributes... -->
              <xsl:if test="(count (../@*) &gt; 2) or ((count (../@*) = 2) and (string-length(../@*[1]) + string-length(../@*[2]) &gt; 72))">
                <xsl:text>&lt;PRE&gt;</xsl:text>
                <xsl:choose>
                  <xsl:when test="(local-name()='url' and starts-with(normalize-space(.),'javascript:'))">
                    <xsl:text>&lt;PRE&gt;</xsl:text>
                    <xsl:value-of select="." disable-output-escaping="yes"/>
                    <xsl:text>&lt;/PRE&gt;</xsl:text>
                  </xsl:when>
                  <!-- make single url reference into actual A HREF= link -->
                  <xsl:when test="(local-name()='url' or contains(local-name(), 'Url') or (local-name(..)='meta' and (./@name='url' or ./@name='filename' or ...)}"} and (local-name()='xml:space' or local-name()='space')) -->
<!-- valid field found by the preceding checks, now output accordingly -->
<!-- single attributes can stay on same line, skip line otherwise -->
<!-- problem: appears to be counting default attributes in addition to user-defined attributes... -->
<xsl:if test="(count (../@*) &gt; 2) or ((count (../@*) = 2) and (string-length(../@*[1]) + string-length(../@*[2]) &gt; 72))">
  <xsl:text>&lt;PRE&gt;</xsl:text>
  <xsl:value-of select="." disable-output-escaping="yes"/>
  <xsl:text>&lt;/PRE&gt;</xsl:text>
</xsl:if>
<xsl:text> &lt;/xsl:text>
  </xsl:text> &lt;font color=&quot;GREEN&quot;&gt;&lt;/font&gt;&lt;B&gt;=&apos;&lt;/B&gt;&lt;/xsl:text>
</xsl:choose>
<!-- print out urls containing javascript source without further ado -->
  <xsl:when test="(local-name()='url' and starts-with(normalize-space(.),'javascript:'))">
    <xsl:text>&lt;PRE&gt;</xsl:text>
    <xsl:value-of select="." disable-output-escaping="yes"/>
    <xsl:text>&lt;/PRE&gt;</xsl:text>
  </xsl:when>
  <!-- make single url reference into actual A HREF= link -->
  <xsl:when test="(local-name()='url' or contains(local-name(), 'Url') or (local-name(..)='meta' and (./@name='url' or ...)}"} and (local-name()='xml:space' or local-name()='space')) -->
<!-- valid field found by the preceding checks, now output accordingly -->
<!-- single attributes can stay on same line, skip line otherwise -->
<!-- problem: appears to be counting default attributes in addition to user-defined attributes... -->
<xsl:if test="(count (../@*) &gt; 2) or ((count (../@*) = 2) and (string-length(../@*[1]) + string-length(../@*[2]) &gt; 72))">
  <xsl:text>&lt;PRE&gt;</xsl:text>
  <xsl:value-of select="." disable-output-escaping="yes"/>
  <xsl:text>&lt;/PRE&gt;</xsl:text>
</xsl:if>
<xsl:text> &lt;/xsl:text>
  </xsl:text> &lt;font color=&quot;GREEN&quot;&gt;&lt;/font&gt;&lt;B&gt;=&apos;&lt;/B&gt;&lt;/xsl:text>
</xsl:choose>
<!-- print out urls containing javascript source without further ado -->
  <xsl:when test="(local-name()='url' and starts-with(normalize-space(.),'javascript:'))">
    <xsl:text>&lt;PRE&gt;</xsl:text>
    <xsl:value-of select="." disable-output-escaping="yes"/>
    <xsl:text>&lt;/PRE&gt;</xsl:text>
  </xsl:when>
  <!-- make single url reference into actual A HREF= link -->
  <xsl:when test="(local-name()='url' or contains(local-name(), 'Url') or (local-name(..)='meta' and (./@name='url' or ...)}"} and (local-name()='xml:space' or local-name()='space')) -->
<!-- valid field found by the preceding checks, now output accordingly -->
<!-- single attributes can stay on same line, skip line otherwise -->
<!-- problem: appears to be counting default attributes in addition to user-defined attributes... -->
<xsl:if test="(count (../@*) &gt; 2) or ((count (../@*) = 2) and (string-length(../@*[1]) + string-length(../@*[2]) &gt; 72))">
  <xsl:text>&lt;PRE&gt;</xsl:text>
  <xsl:value-of select="." disable-output-escaping="yes"/>
  <xsl:text>&lt;/PRE&gt;</xsl:text>
</xsl:if>
<xsl:text> &lt;/xsl:text>
  </xsl:text> &lt;font color=&quot;GREEN&quot;&gt;&lt;/font&gt;&lt;B&gt;=&apos;&lt;/B&gt;&lt;/xsl:text>
</xsl:choose>
<xsl:template name="URL-ize-MFString-elements">
  <xsl:param name="list"/>
  <xsl:variable name="wlist" select="concat(normalize-space($list), ' ')"/>
  <!-- output URL-ized nextURL -->
</xsl:template>
</xsl:template>

<!-- ****** children: flag wrapper tags ****** -->
<xsl:template match="appearance[parent::Shape] |
    children[parent::Anchor or parent::Billboard or parent::Collision or parent::Group or
    parent::Transform] |
    choice[parent::Switch] |
    color[parent::ElevationGrid or parent::IndexedFaceSet or parent::IndexedLineSet or
    parent::PointSet] |
    coord[parent::IndexedFaceSet or parent::IndexedLineSet or parent::PointSet] |
    fontStyle[parent::Text] |
    geometry[parent::Shape] |
    level[parent::LOD] |
    material[parent::Appearance] |
    normal[parent::ElevationGrid or parent::IndexedFaceSet] |
    source[parent::Sound] |
    texCoord[parent::ElevationGrid or parent::IndexedFaceSet] |
    texture[parent::Appearance] |
    textureTransform[parent::Appearance]">

<!-- first, output tag name -->
<xsl:text>&lt;font color="BLUE"&gt;&amp;lt;</xsl:text><xsl:value-of select="local-name()"/>

<!-- appropriate angle-bracket close of first tag -->
<xsl:choose>
    <xsl:when test="not(*)"><xsl:text>/&amp;gt;</xsl:text></xsl:when>
    <xsl:otherwise><xsl:text>&amp;gt;</xsl:text></xsl:otherwise>
</xsl:choose>

<!-- insert warning comment after wrapper tag -->
<!-- <xsl:comment> wrapper tag </xsl:comment> -->
<!-- prepare format for next tag, insert blockquote if children present -->
<xsl:choose>
    <xsl:when test="not(*)"><xsl:text>&#10;&lt;/font&gt;&amp;lt;/xsl:text><xsl:apply-templates select="*" mode="all" /></xsl:when>
    <xsl:otherwise><xsl:text>&lt;/font&gt;&lt;blockquote&gt;</xsl:otherwise>
</xsl:choose>

215
F. X3DToHTMLM OUTPUT HELLOWORLD.HTML

<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE X3D PUBLIC "http://www.Web3D.org/TaskGroups/x3d/translation/x3d-compact.dtd"
"file:///C:/www.Web3D.org/TaskGroups/x3d/translation/x3d-compact.dtd">
<html>
<head>
<meta name='filename' content='HelloWorld.xml'/>
<meta name='description' content='Simple X3D example'/>
<meta name='revised' content='30 October 2000'/>
<meta name='author' content='Don Brutzman'/>
</head>
<meta name='url' content='http://www.Web3D.org/TaskGroups/x3d/translation/examples/HelloWorld.xml'/>

<!-- Example scene to illustrate X3D tags and attributes. -->

<Scene>
  <Group>
    <Viewpoint description='XML Presentation!' orientation='0 1 0 1.57' position='9 - 1 0'/>
    <NavigationInfo type='EXAMINE' 'ANY'/>
    <Shape>
      <Sphere DEF='S'/>
      <Appearance>
        <ImageTexture url='earth-topo.png' 'earth-topo-small.gif'
        'C://www.Web3D.org/TaskGroups/x3d/translation/examples/earth-topo.png'
        'C://www.Web3D.org/TaskGroups/x3d/translation/examples/earth-topo-small.gif'/>
      </Appearance>
    </Shape>
    <Transform rotation='0 1 0 1.57' translation='0 -2 1.25'>
      <Shape>
        <Text string='XML Presentation!' />
        <Appearance>
          <Material diffuseColor='0.1 0.5 1'/>
        </Appearance>
      </Shape>
    </Transform>
  </Group>
</Scene>
G.  COCHELLOWORLD.XML

<?xml-stylesheet href="x3dvrm.xsl" type="text/xsl"?>
<!-- developed with XML Spy v4.0 U (http://www.xmlspy.com) by Clifton Williams (Naval Postgraduate School) -->

<?cocoon-process type="xslt"?>
?page>
<title> Cocoon wrapped HelloWorld.xml </title>
<vrml>
#VRML V2.0 utf8
# X3D-to-VRML-97 XSL translation autogenerated by X3dToVrml97.xsl
# http://www.Web3D.org/TaskGroups/x3d/translation/X3dToVrml97.xsl

# [X3D]  VRML V3.0 utf8

# [head]
# [meta] filename: HelloWorld.xml
# [meta] description: Simple X3D example
# [meta] revised: 30 October 2000
# [meta] author: Don Brutzman

# [Scene]
# Example scene to illustrate X3D tags and attributes.
Group {
  children [
    Viewpoint {
      description "XML Presentation!"
      orientation 0 1 0 1.57
    }
  ]
}
position 9 -1 0
}
NavigationInfo {
  type [ "EXAMINE" "ANY" ]
}
Shape {
  geometry DEF S Sphere {
  }
  appearance Appearance {
    texture ImageTexture {
      url [ "earth-topo.png" "earth-topo-small.gif"
      "C://www.Web3D.org/TaskGroups/x3d/translation/examples/earth-topo.png"
      "C://www.Web3D.org/TaskGroups/x3d/translation/examples/earth-topo-small.gif" ]
    }
  }
}
Transform {
  rotation 0 1 0 1.57
  translation 0 -2 1.25
  children [ Shape {
    geometry Text {
      string [ "XML Presentation!" ]
    }
    appearance Appearance {
      material Material {
        diffuseColor 0.1 0.5 1
      }
    }
  }
  ]
}
H. COCKELPFOREST.XML

<?xml version="1.0"?>
<?xml-stylesheet href="x3dvrml.xsl" type="text/xsl"?>
<?cocoon-process type="xslt"?>
<!-- developed with XML Spy v4.0 U (http://www.xmlspy.com) by Clifton Williams (Naval Postgraduate School) -->

<title>Cocoon wrapped Kelp Forest</title>

#VRML V2.0 utf8
<vrml>
WorldInfo {
    title "NPS Virtual Kelp Forest Exhibit"
    info ["kelpForestMain3.4.wrl",
              "Model of the Monterey Bay Aquarium Kelp Forest",
              "DTG of last updated: 111500Jun98",
              "Added: ",
              "Updated: kelpTank2.9.wrl; ",
              "Created by Naval Postgraduate School students under the supervision of Don Brutzman",
              "Feel free to copy anything you wish - just give credit where it is due"
            "http://localhost/cocoon/samples/kelpForest/"
    ]
}

DEF Root Group {
    children[
        NavigationInfo {

}}
type ["EXAMINE" "FLY" "WALK" "ANY"]
speed 3.0
}

Viewpoint {
    description "Kelp Forest Monterey Bay Aquarium"
    position 0.0 -5.0 45.0
}

Viewpoint {
    description "Front Windows"
    position 0.0 -4.5 7.5
    orientation 1 0 0 .15
    fieldOfView .95
}

Viewpoint {
    description "Side Windows"
    position 25 -4 15
    orientation 0 1 0 .9
    fieldOfView .5
}

Viewpoint {
    description "Star Fish"
    position 14 -5.75 1
    orientation 0 1 0 1.25
}

Viewpoint {
    description "Inside Tank"
    position 0.0 -5.0 -7.0
    orientation 0.0 1.0 0.0 3.14
}
Viewpoint {
    description "Top floor"
    position 12.5 5 -2
    orientation -0.3 1 0.3 1.57079
    fieldOfView 1.04719
}

Viewpoint {
    description "Bird's Eye View"
    position 0.0 19.0 -3.5
    orientation 1.0 0.0 0.0 -1.57
}

Viewpoint {
    description "Pump House"
    position -5 1 0
    orientation 0.0 1.0 0.0 1.3
    fieldOfView .6
}

Background {
    skyColor [
        0.0 0.5 1.0,
        0.0 0.0 1.0,
        0.0 0.0 1.0
    ]
    skyAngle [ 1.309, 1.571 ]
    groundColor [
        0.1 0.10 0.0,
        0.4 0.25 0.2,
        0.6 0.60 0.6,
    ]
    groundAngle [ 1.309, 1.571 ]
}
url["file:///C:/jakarta-tomcat-3.2.3/Webapps/cocoon/samples/vrml/kelpForest/kelpTank2.9.wrl"
    "kelpTank2.9.wrl"
    ]

} Transform{
    translation 0.3 -3.3 7.3
    scale 0.54 0.75 0.52
    children[
        Inline{
            url["file:///C:/jakarta-tomcat-3.2.3/Webapps/cocoon/samples/vrml/kelpForest/rockFloor1.5.wrl"
                "rockFloor1.5.wrl"
            ]
        }
    ]
}# DEF K1_LOCALE Transform {
#     translation -10.0 0.0 2.0
#     children [
#         # DEF K1_SHALLOW Transform {
#             translation 0.0 0.0 0.0
#             children [
#             ]
#         #} #end K1_SHALLOW
#
#         # DEF K1_MIDWATER Transform {
#             translation 0.0 0.0 0.0
#             children [
#             ]
#         #} #end K1_MIDWATER

225
DEF K1_DEEP Transform {
    #
    translation 0.0 0.0 0.0
    children [
    ]
    #}
    #end K1_DEEP

DEF K1_FLOOR Transform {
    #
    translation 0.0 0.0 0.0
    children [
    ]
    #}
    #end K1_FLOOR
    #
}
    #end K1_LOCALE Transform

DEF K2_LOCALE Transform {
    translation -4 0 1
    children [

    DEF K2_SHALLOW Transform {
    #
    translation 0.0 0.0 0.0
    children [
    ]
    #}
    #end K2_SHALLOW

    DEF K2_MIDWATER Transform {
    translation -1 -4 -4
    scale .20 .20 .20
    children [
        Inline {
            url [ "file:///C:/jakarta-tomcat-3.2.3/Webapps/cocoon/samples/vrml/kelpForest/SardineSchool.gz.wrl"
        ]
    ]
    #}
    #end K2_MIDWATER
}
"file:///C:/jakarta-tomcat-3.2.3/Webapps/cocoon/samples/vrml/kelpForest/SardineSchool/SardineSchool.gz.wrl"
"file:///C:/jakarta-tomcat-3.2.3/Webapps/cocoon/samples/vrml/kelpForest/SardineSchool.wrl"
"file:///C:/jakarta-tomcat-3.2.3/Webapps/cocoon/samples/vrml/kelpForest/SardineSchool/SardineSchool.gz.wrl"
"SardineSchool.gz.wrl"
"SardineSchool/SardineSchool.gz.wrl"
"SardineSchool.wrl"
"SardineSchool/SardineSchool.wrl"

# modeled by Stewart Liles

} #end K2_MIDWATER

# DEF K2_DEEP Transform {
#   translation 0.0 0.0 0.0
#   children [
#   ]
# } #end K2_DEEP

DEF K2_FLOOR Transform {
  translation -1.9 -8.5 -1.5
  rotation 0 1 0 .44
  scale .5 .9 .5
  children [
    Inline {
      url ["file:///C:/jakarta-tomcat-3.2.3/Webapps/cocoon/samples/vrml/kelpForest/kelpNoBase.wrl"
            "kelpNoBase.wrl" ]
    }
  ]
}
} #end K2_LOCALE Transform

#
DEF K3_LOCALE Transform {
  translation  -10.0 0.0 2.0
  children [ 
    
    DEF K3_SHALLOW Transform { 
      translation 0.0 0.0 0.0
      children [ 
      ]
    } #end K3_SHALLOW
    
    DEF K3_MIDWATER Transform { 
      translation 0.0 0.0 0.0
      children [ 
      ]
    } #end K3_MIDWATER
    
    DEF K3_DEEP Transform { 
      translation 0.0 0.0 0.0
      children [ 
      ]
    } #end K3_DEEP
    
    DEF K3_FLOOR Transform { 
      translation 0.0 0.0 0.0
      children [ 
      ]
    } #end K3_FLOOR
  ]
} #end K3_LOCALE Transform
DEF K4_LOCALE Transform {
  translation  -2.5 0 -2.5
  children [ 
    #
    Def K4_SHALLOW Transform {
      translation 0.0 0.0 0.0
      children [ 
        #
      ]
    } #end K4_SHALLOW
    #
    DEF K4_MIDWATER Transform {
      translation -10.0 -2.0 -2
      children [ Inline {
        url["file:///C:/jakarta-tomcat-3.2.3/Webapps/cocoon/samples/vrml/kelpForest/HalfmoonGroup.wrl"
          "HalfmoonGroup.wrl"
        ]
      } ]
    } #end K4_MIDWATER
    #
    DEF K4_DEEP Transform {
      translation 0.0 0.0 0.0
      children [ 
        #
      ]
    } #end K4_DEEP
    #
    DEF K4_FLOOR Transform {
      translation -1.5 -7.5 .5
      rotation 0 1 0 -.3
      scale .5 .8 .5
      children [ Inline {

url"file:///C:/jakarta-tomcat-3.2.3/Webapps/cocoon/samples/vrml/kelpForest/kelpNoBase.wrl"
kelpNoBase.wrl"
]
     
  
  
]#end K4_LOCALE Transform

# DEF K5_LOCALE Transform {
#     translation -10.0 0.0 2.0
#     children [

#         DEF K5_SHALLOW Transform {
#             translation 0.0 0.0 0.0
#             children [
#                 ]
#         }#end K5_SHALLOW

#         DEF K5_MIDWATER Transform {
#             translation 0.0 0.0 0.0
#             children [
#                 ]
#         }#end K5_MIDWATER

#         DEF K5_DEEP Transform {
#             translation 0.0 0.0 0.0
#             children [
#                 ]
#         }#end K5_DEEP

#         DEF K5_FLOOR Transform {
#             translation 0.0 0.0 0.0


230
DEF K6_LOCALE Transform {
  translation  -10.0 0.0 2.0
  children [
    DEF K6_SHALLOW Transform {
      translation  0.0 0.0 0.0
      children [

    ]
    #end K6_SHALLOW

    DEF K6_MIDWATER Transform {
      translation  0.0 0.0 0.0
      children [

    ]
    #end K6_MIDWATER

    DEF K6_DEEP Transform {
      translation  0.0 0.0 0.0
      children [

    ]
    #end K6_DEEP

    DEF K6_FLOOR Transform {
      translation  0.0 0.0 0.0
      children [

    ]
    #end K6_FLOOR
  ]
}#end K6_LOCALE Transform
children [ 
  Inline { 
    url["file:///C:/jakarta-tomcat-3.2.3/Webapps/cocoon/samples/vrml/kelpForest/kelpNoBase.wrl" "kelpNoBase.wrl"
      ]
  }
}
}
}

}#end K7_LOCALE Transform

# DEF K8_LOCALE Transform {
#  translation -10.0 0.0 2.0
#  children [ 

#       DEF K8_SHALLOW Transform { 
#        translation 0.0 0.0 0.0 
#        children [ 
#        ]
#       }#end K8_SHALLOW

# DEF K8_MIDWATER Transform { 
#  translation 0.0 0.0 0.0 
#  children [ 
#  ]
# }#end K8_MIDWATER

# DEF K8_DEEP Transform { 
#  translation 0.0 0.0 0.0 
#  children [ 
#  ]
# }#end K8_DEEP
DEF K8_FLOOR Transform {
  translation 0.0 0.0 0.0
  children [ 
    ]
}

DEF K9_FLOOR Transform {
  translation 0.0 0.0 0.0
  children [ 
    ]
}

DEF K9_LOCALE Transform {
  translation -10.0 0.0 2.0
  children [ 
    DEF K9_SHALLOW Transform {
      translation 0.0 0.0 0.0
      children [ 
        ]
    }
    DEF K9_MIDWATER Transform {
      translation 0.0 0.0 0.0
      children [ 
        ]
    }
    DEF K9_DEEP Transform {
      translation 0.0 0.0 0.0
      children [ 
        ]
    }
  ]
#end K9_LOCALE Transform

DEF K9_FLOOR Transform {
  translation 0.0 0.0 0.0
  children [ 
    ]
}
DEF K10_LOCALE Transform {
  translation 7.0 0.0 2.0
  children [
    #
    #   
    #]
  #}#end K10_LOCALE

DEF K10_SHALLOW Transform {
  translation 0.0 0.0 0.0
  children [
    #
    #]
  }#end K10_SHALLOW

DEF K10_MIDWATER Transform {
  translation 0.0 0.0 0.0
  children [
    #
    #]
  }#end K10_MIDWATER

DEF K10_DEEP Transform {
  translation 0 -5 0
  children [
    Inline {
      url[file:///C:/jakarta-tomcat-3.2.3/Webapps/cocoon/samples/vrml/kelpForest/StripedSurfperch.wrl]
      "StripedSurfperch.wrl"
    }
  ]
}#end K10_DEEP

DEF K10_FLOOR Transform {
  translation -1 -7 -1
  children [
    #
    #]
}#end K10_FLOOR
DEF K11_LOCALE Transform {
  translation 8.0 0.0 -2.0
  children [
    #
    #  DEF K11_SHALLOW Transform {
    #     translation 0.0 0.0 0.0
    #     children [
    #          ]
    #  }  #end K11_SHALLOW
    #
    #  DEF K11_MIDWATER Transform {
    #     translation 2.19 -7.0 0.15
    #     rotation 0.0 1.0 0.3
    #     children [
    Inline {
      url["file:///C:/jakarta-tomcat-3.2.3/Webapps/cocoon/samples/vrml/kelpForest/starFish1.8.wrl"
          "starFish1.8.wrl"
      ]
    }
    ]
  } #end K11_MIDWATER
DEF K11_MIDWATER

Transform {
  translation 1.0 -5 0
  rotation 0 1 0 .9
  children [
    Inline {
      url["file:///C:/jakarta-tomcat-3.2.3/Webapps/cocoon/samples/vrml/kelpForest/BlackSurfperch.wrl"
        "BlackSurfperch.wrl" #moves in and out of rock
    }
  ]
}

}#end K11_MIDWATER

DEF K11_DEEP Transform {
  translation 1.0 -5 0
  rotation 0 1 0 .9
  children [
    Inline {
      url["file:///C:/jakarta-tomcat-3.2.3/Webapps/cocoon/samples/vrml/kelpForest/BlackSurfperch.wrl"
        "BlackSurfperch.wrl" #moves in and out of rock
    }
  ]
}

}#end K11_DEEP

DEF K11_FLOOR Transform {
  translation -.3 -7 0
  rotation 0 1 0 .3
  scale .5 .75 .5
  children [
    Inline {
      url["file:///C:/jakarta-tomcat-3.2.3/Webapps/cocoon/samples/vrml/kelpForest/kelpNoBase.wrl"
        "kelpNoBase.wrl"
    }
  ]
}

] }#end K11_FLOOR

Transform {
  translation 1.3 -5.0 3.0
  children [
    Inline {

url["file:///C:/jakarta-tomcat-3.2.3/Webapps/cocoon/samples/vrml/kelpForest/kelpSurfperch.wrl"
  "kelpSurfperch.wrl"

]  

}#end R2_DEEP

# DEF R2_FLOOR Transform {
#  translation 0.0 0.0 0.0
#  children [  
#  ]  
# }#end R2_FLOOR Transform

DEF R2_LOCALE Transform {
  translation 3 0 -4
  children [ 
    
    DEF R3_SHALLOW Transform {  
      translation 0.0 0.0 0.0  
      children [  
        
      ]  
    }#end R3_SHALLOW

    DEF R3_MIDWATER Transform {
      translation 0.0 -6 0.0
      children [ 
        Inline {
          url["file:///C:/jakarta-tomcat-3.2.3/Webapps/cocoon/samples/vrml/kelpForest/garibaldi.wrl"}#end R3_MIDWATER

"garibaldi.wrl"
]

)
}#end R3_MIDWATER

# DEF R3_DEEP Transform {
# translation 0.0 0.0 0.0
# children [
# ]
# }#end R3_DEEP

# DEF R3_FLOOR Transform {
# translation 0.0 0.0 0.0
# children [
# ]
# }
#}#end R3_LOCALE Transform

# DEF R4_LOCALE Transform {
# translation 7 0.0 2.0
# children [
# 
# DEF R4_SHALLOW Transform {
# translation 0.0 0.0 0.0
# children [
# ]
# }#end R4_SHALLOW

# DEF R4_MIDWATER Transform {
# translation 0.0 0.0 0.0
# children [
DEF R4_MIDWATER Transform {
    translation 0.0 0.0 0.0
    children [ ]
}

DEF R4_DEEP Transform {
    translation 0.0 0.0 0.0
    children [ ]
}

DEF R4_FLOOR Transform {
    translation 0.0 0.0 0.0
    children [ ]
}

DEF R5_LOCALE Transform {
    translation 8 0 -2
    children [ ]
}

DEF R5_SHALLOW Transform {
    translation -2 -2 0
    children [ Inline {
        url["file:///C:/jakarta-tomcat-3.2.3/Webapps/cocoon/samples/vrml/kelpForest/kelpBass.wrl"
            "kelpBass.wrl"
        ]
    }]
}

) end R5_SHALLOW

) end R4_LOCALE Transform

) end R4_FLOOR Transform

) end R4_DEEP Transform

) end R4_MIDWATER Transform
DEF R5_MIDWATER Transform {
    translation 0.0 0.0 0.0
    children [ ]
}#end R5_MIDWATER

DEF R5_DEEP Transform {
    translation 0.0 0.0 0.0
    children [ ]
}#end R5_DEEP

DEF R5_FLOOR Transform {
    translation 0.0 0.0 0.0
    children [ ]
}#end R5_FLOOR

}#end R5_LOCALE Transform

DEF WAVE_CLOCK TimeSensor {
    cycleInterval 5.5
    enabled FALSE # master startup clock will initialize all TimeSensors synchronously
    loop TRUE
}

DEF LEFT_SHALLOW_WAVE PositionInterpolator{
    key[0, .125, .25, .375, .5, .625, .75, .875, 1]
    keyValue[
        0       0      0,
        0.056  -0.085  0,
        0.08   -0.12   0,
        ]

DEF LEFT_DEEP_WAVE PositionInterpolator{
  key[0, .125, .25, .375, .5, .625, .75, .875, 1
  keyValue[
    0 0 0,
    0.035 -0.035 0,
    0.05 -0.05 0,
    0.035 -0.035 0,
    0 0 0,
    -0.035 0.035 0,
    -0.05 0.05 0,
    -0.035 0.035 0,
    0 0 0
  ]
}

DEF CENTER_WAVE PositionInterpolator{
  key[0, .125, .25, .375, .5, .625, .75, .875, 1
  keyValue[
    0 0 0,
    0.106 0 0,
    0.15 0 0,
    0.106 0 0,
    0 0 0,
    -0.106 0 0,
    -0.15 0 0,
    -0.106 0 0,
    -0.15 0 0
  ]
}
DEF RIGHT_SHALLOW_WAVE PositionInterpolator{
    key[0, .125, .25, .375, .5, .625, .75, .875, 1]
    keyValue[
        0 0 0,
        0.056 0.085 0,
        0.08 0.12 0,
        0.056 0.085 0,
        0 0 0,
        -0.056 -0.085 0,
        -0.08 -0.12 0,
        -0.056 -0.085 0,
        0 0 0
    ]
}

DEF RIGHT_DEEP_WAVE PositionInterpolator{
    key[0, .125, .25, .375, .5, .625, .75, .875, 1]
    keyValue[
        0 0 0,
        0.035 0.035 0,
        0.05 0.05 0,
        0.035 0.035 0,
        0 0 0,
        -0.035 -0.035 0,
        -0.05 -0.05 0,
        -0.035 -0.035 0,
        0 0 0
    ]
}
}#end collision children
)#end collision node

)#end kelpForestMain

#ROUTE WAVE_CLOCK.fraction_changed TO LEFT_SHALLOW_WAVE.set_fraction
#ROUTE WAVE_CLOCK.fraction_changed TO LEFT_DEEP_WAVE.set_fraction
ROUTE WAVE_CLOCK.fraction_changed TO CENTER_WAVE.set_fraction
#ROUTE WAVE_CLOCK.fraction_changed TO RIGHT_SHALLOW_WAVE.set_fraction
#ROUTE WAVE_CLOCK.fraction_changed TO RIGHT_DEEP_WAVE.set_fraction
# also need to route this clock to pump and water surface,
# so put all of these sensors/routes/transforms in top-level scene

ROUTE CENTER_WAVE.value_changed TO K7_MIDWATER.set_translation
ROUTE RIGHT_DEEP_WAVE.value_changed TO K2_MIDWATER.set_translation
ROUTE CENTER_WAVE.value_changed TO K4_MIDWATER.set_translation
ROUTE LEFT_DEEP_WAVE.value_changed TO K10_DEEP.set_translation
ROUTE LEFT_DEEP_WAVE.value_changed TO K11_DEEP.set_translation
ROUTE RIGHT_SHALLOW_WAVE.value_changed TO R2_MIDWATER.set_translation
ROUTE RIGHT_DEEP_WAVE.value_changed TO R2_DEEP.set_translation
ROUTE CENTER_WAVE.value_changed TO R3_MIDWATER.set_translation
ROUTE RIGHT_SHALLOW_WAVE.value_changed TO R5_SHALLOW.set_translation
# etc. route one of five wave clocks to each locale
</vrml>
</page>
I. COCAMPHIBIOUSRAID.XML

<?xml version="1.0"?>
<!-- developed with XML Spy v4.0 U (http://www.xmlspy.com) by Clifton Williams (Naval Postgraduate School) -->
<?xml-stylesheet href="x3dvrml.xsl" type="text/xsl"?>
<?cocoon-process type="xslt"?>
<!-- Edited by Clifton Williams" -->
<page>
  <title> Cocoon wrapped AmphibiousRaid.xml </title>

#VRML V2.0 utf8
<vrml>
  <!-- This is the start of the WRL file code -->

# X3D-to-VRML-97 XSL translation autogenerated by X3dToVrml97.xsl
# http://www.web3D.org/TaskGroups/x3d/translation/X3dToVrml97.xsl

# [X3D] VRML V3.0 utf8

# [head]
# [meta] filename: AmphibiousRaid.xml
# [meta] description: Amphibious Raid shows an exemplar amphibious raid at Red Beach, Camp Pendleton California. It is the primary scenario for the SAVAGE group.
# [meta] author: Don Brutzman, Curtis Blais, Jeff Weekley, Jane Wu, Shane Nicklaus, MIke Hunsberger
# [meta] created: 9 April 2001
# [meta] revised: 27 July 2001
# [meta] reference: NpsRedBeachRaidScenario2001May2.ppt
# [meta] image: HeloPatrolPendletonBackground.png
# [meta] reference: AmphibiousRaidWithCommunications.xml
# [meta] warning: Coordinate system axes need to be aligned properly.
EXTERNPROTO EspduTransform {
    eventOut SFTime timestamp # DIS timestamp in VRML units
    field SFString marking    # 0..11 character label for entity
    field SFTime readInterval # seconds between read updates, 0 means no reading
    field SFTime writeInterval # seconds between write updates, 0 means no writing
    field SFString address    # multicast address or "localhost"
    field SFInt32 port        # port number
    field SFInt32 siteID      # EntityID triplet, first element
    field SFInt32 applicationID # EntityID triplet, second element
    field SFInt32 entityID    # EntityID triplet, third element

    # Standard VRML Transform fields - - - - - - - - - - - - - - - - - - - - - - - - - -
    exposedField MFNode children
    exposedField SFVec3f translation  # default prior to DIS update
    exposedField SFRotation rotation    # default prior to DIS update
    exposedField SFVec3f scale
    exposedField SFRotation scaleOrientation
    field SFVec3f bboxCenter
    field SFVec3f bboxSize
    exposedField SFVec3f center
    eventIn MFNode addChildren
    eventIn MFNode removeChildren

    # Automatic MulticastRelayClient if no multicast heard - - - - - - - - - - - - - -
    field SFString multicastRelayHost
    field SFInt32 multicastRelayPort
    field SFBool rtpHeaderExpected # whether RTP headers are prepended to DIS
eventOut SFBool rtpHeaderHeard

# Collision/Detonation/Fire PDU heard, or no active ESPDUs heard - - - - - - - - - -
eventOut SFBool active # have we had an update recently?
eventOut SFBool collided # has a CollisionPDU reported a collision?
eventOut SFTime collideTime # when were we collided with?
eventOut SFBool detonated # has a DetonationPDU reported a detonation?
eventOut SFTime detonateTime # when were we detonated?
eventOut SFBool fired1 # have we shot a Fire (weapon) PDU (primary)?
eventOut SFBool fired2 # have we shot a Fire (weapon) PDU (secondary)?
eventOut SFTime firedTime # when did we shoot a Fire (weapon) PDU?
eventOut SFVec3f munitionStartPoint # exercise coordinates

# Articulated Parameter (user-defined payload) fields - - - - - - - - - - - - - - - - - - - -

eventOut SFInt32 articulationParameterCount # articulated parameters available
eventOut SFFloat articulationParameterValue0 # user-defined payload value
eventOut SFFloat articulationParameterValue1 # user-defined payload value
eventOut SFFloat articulationParameterValue2 # user-defined payload value
eventOut SFFloat articulationParameterValue3 # user-defined payload value
eventOut SFFloat articulationParameterValue4 # user-defined payload value
eventOut SFFloat articulationParameterValue5 # user-defined payload value
eventOut SFFloat articulationParameterValue6 # user-defined payload value
eventOut SFFloat articulationParameterValue7 # user-defined payload value
eventOut SFFloat articulationParameterValue8 # user-defined payload value
eventOut SFFloat articulationParameterValue9 # user-defined payload value
eventOut SFFloat articulationParameterValue10 # user-defined payload value
eventOut SFFloat articulationParameterValue11 # user-defined payload value
eventOut SFFloat articulationParameterValue12 # user-defined payload value
eventOut SFFloat articulationParameterValue13 # user-defined payload value
eventOut SFFloat articulationParameterValue14 # user-defined payload value

# Trace fields - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

249
exposedField  SFCOLOR  traceColor  
# color of VRML trace text
exposedField  SFVec3f  traceOffset  
# VRML text position relative to entity
exposedField  SFVec3f  traceSize  
# VRML text scale
field  SFBool  traceJava  
# Java console tracing enabled?

] [#"EspduTransformPROTO.wrl#EspduTransform"#
local or remote URLs for the EXTERNPROTO
"file:///C:/vrtp/mil/navy/nps/dis/EspduTransformPROTO.wrl#EspduTransform"
"file:///D:/vrtp/mil/navy/nps/dis/EspduTransformPROTO.wrl#EspduTransform"
"file:///C:\vrtp/mil/navy/nps/dis/EspduTransformPROTO.wrl#EspduTransform"
"file:///D:/vrtp/mil/navy/nps/dis/EspduTransformPROTO.wrl#EspduTransform"
"file:///vrtp/mil/navy/nps/dis/EspduTransformPROTO.wrl#EspduTransform"
"file:///vrtp/mil/navy/nps/dis/EspduTransformPROTO.wrl#EspduTransform"

"/vrtp/mil/navy/nps/dis/EspduTransformPROTO.wrl#EspduTransform"
"../vrtp/mil/navy/nps/dis/EspduTransformPROTO.wrl#EspduTransform"
"../../../vrtp/mil/navy/nps/dis/EspduTransformPROTO.wrl#EspduTransform"
"../../../../vrtp/mil/navy/nps/dis/EspduTransformPROTO.wrl#EspduTransform"
"../../../../../../../vrtp/mil/navy/nps/dis/EspduTransformPROTO.wrl#EspduTransform"
"../../../../../../../../vrtp/mil/navy/nps/dis/EspduTransformPROTO.wrl#EspduTransform"
"../../../../../../../vrtp/mil/navy/nps/dis/EspduTransformPROTO.wrl#EspduTransform"

] [

# [Scene]

# Prototype and external prototype declarations must precede scene definition

250
EXTERNPROTO HiddenViewpoint [  
  exposedField SFVec3f position  
  exposedField SFRotation rotation  
  field SFFloat sensorRadius  
  exposedField MFString label  
  exposedField SFVec3f labelOffset  
  field SFFloat labelFontSize  
  exposedField SFColor labelColor  
] 
  "file:///C:/jakarta-tomcat-3.2.3/webapps/cocoon/samples/vrml/Savage/Tools/Animation/HiddenViewpointPrototype.wrl#HiddenViewpoint"  
  "http://web.nps.navy.mil/~brutzman/Savage/Tools/Animation/HiddenViewpointPrototype.wrl#HiddenViewpoint"  
  "file:///C:/jakarta-tomcat-3.2.3/webapps/cocoon/samples/vrml/Savage/Tools/Animation/HiddenViewpointPrototype.xml#HiddenViewpoint"  
  "http://web.nps.navy.mil/~brutzman/Savage/Tools/Animation/HiddenViewpointPrototype.xml#HiddenViewpoint"
]  
EXTERNPROTO WaypointInterpolator [  
  # nodeTypeHint Group  
  field MFVec3f wayPoints  
  field SFBool pitchUpDownForVerticalWayPoints  
  # Priority of use: legSpeeds (m/sec), legDurations (seconds), defaultSpeed (m/sec)  
  # If used, array lengths for legSpeeds and legDurations must be one less than number of wayPoints.  
  field MFFloat legSpeeds  
  field MFTime legDurations  
  field SFFloat defaultSpeed  
  # turningRate (degrees/second) will also determine standoff distance prior to waypoint where turn commences. If 0, turns are instantaneous.  
}
field        SFFloat  turningRate
eventOut     SFTime   totalDuration

# exposed PositionInterpolator and OrientationInterpolator settings:
eventIn      SFFloat   fraction
eventOut     SFVec3f  positionValue
eventOut     SFRotation  orientationValue
exposedField SFColor   lineColor

# highlightSegmentColors must contain two color values, for each endpoint of the highlight
segment.
exposedField MFColor  highlightSegmentColors  ### XSL-translation warning:  IS declarations
not allowed for Script or ExternProtoDeclare, ignoring IS value
### XSL-translation warning:  IS references not allowed inside EXTERNPROTO field
declarations, ignored  ### IS HighlightSegmentColorNode.color
exposedField SFFloat   transparency
field        SFVec3f  labelOffset
field        SFFloat   labelFontSize
field        SFColor   labelColor
field        SFBool    traceEnabled
]
"file:///C:/jakarta-tomcat-
3.2.3/webapps/cocoon/samples/vrml/Savage/Tools/Animation/WaypointInterpolatorPrototype.wrl#WaypointInterpolator"
  
  "http://web.nps.navy.mil/~brutzman/Savage/Tools/Animation/WaypointInterpolatorPrototype.wrl#WaypointInterpolator"

"file:///C:/jakarta-tomcat-
3.2.3/webapps/cocoon/samples/vrml/Savage/Tools/Animation/WaypointInterpolatorPrototype.xml#WaypointInterpolator"
  
  "http://web.nps.navy.mil/~brutzman/Savage/Tools/Animation/WaypointInterpolatorPrototype.xml#WaypointInterpolator"
EXTERNPROTO ViewPositionOrientation [
  exposedField SFBool enabled
][
  "file:///C:/jakarta-tomcat-3.2.3/webapps/cocon/samples/vrml/Savage/Tools/Authoring/ViewPositionOrientationPrototype.wrl#ViewPositionOrientation"
  "../../Tools/Authoring/ViewPositionOrientationPrototype.wrl#ViewPositionOrientation"
  "file:///C:/jakarta-tomcat-3.2.3/webapps/cocon/samples/vrml/Savage/Tools/Authoring/ViewPositionOrientationPrototype.xml#ViewPositionOrientation"
  "../../Tools/Authoring/ViewPositionOrientationPrototype.xml#ViewPositionOrientation"
]
EXTERNPROTO CameraCompass36 [
  exposedField SFBool enabled
  exposedField SFVec3f positionOffsetFromCamera
  exposedField SFColor markerColor
  exposedField SFColor labelColor
][
  "file:///C:/jakarta-tomcat-3.2.3/webapps/cocon/samples/vrml/Savage/Tools/HeadsUpDisplays/CameraCompassPrototypes.wrl#CameraCompass36"
  "../../Tools/HeadsUpDisplays/CameraCompassPrototypes.wrl#CameraCompass36"
  "http://web.nps.navy.mil/~brutzman/Savage/Tools/HeadsUpDisplays/CameraCompassPrototypes.wrl#CameraCompass36"
  "file:///C:/jakarta-tomcat-3.2.3/webapps/cocon/samples/vrml/Savage/Tools/HeadsUpDisplays/CameraCompassPrototypes.xml#CameraCompass36"
  "../../Tools/HeadsUpDisplays/CameraCompassPrototypes.xml#CameraCompass36"
  "http://web.nps.navy.mil/~brutzman/Savage/Tools/HeadsUpDisplays/CameraCompassPrototypes.xml#CameraCompass36"
]
EXTERNPROTO AH1SuperCobra {
    # nodeTypeHint Group
    field  SFNode  tailBoomColor
    field  SFNode  tailRotorDriveShaftColor
    field  SFNode  horizontalStabilizerColor
    field  SFNode  fuselageColor
    field  SFNode  cockpitColor
    field  SFNode  cowlingColor
    field  SFString  helicopterName
    eventIn  SFBool  inFlight
}

"file:///C:/jakarta-tomcat-3.2.3/webapps/coocoon/samples/vrml/Savage/AircraftHelicopters/AH1SuperCobra-UnitedStates/SuperCobraPrototype.wrl#SuperCobra"
"..../AircraftHelicopters/AH1SuperCobra-UnitedStates/SuperCobraPrototype.wrl#SuperCobra"
"http://web.nps.navy.mil/~brutzman/Savage/AircraftHelicopters/AH1SuperCobra-UnitedStates/SuperCobraPrototype.wrl#SuperCobra"
"file:///C:/jakarta-tomcat-3.2.3/webapps/coocoon/samples/vrml/Savage/AircraftHelicopters/AH1SuperCobra-UnitedStates/SuperCobraPrototype.xml#SuperCobra"
"..../AircraftHelicopters/AH1SuperCobra-UnitedStates/SuperCobraPrototype.xml#SuperCobra"
"http://web.nps.navy.mil/~brutzman/Savage/AircraftHelicopters/AH1SuperCobra-UnitedStates/SuperCobraPrototype.xml#SuperCobra"
}

# ================
NavigationInfo {
    avatarSize   [ 2 2 2 ]
    speed 100
    type [ "EXAMINE" "ANY" ]
    visibilityLimit 60000
}

Background {
    groundAngle [ 1.309, 1.571 ]
groundColor [ 0 0.2 0.4, 0.05 0.25 0.6, 0.1 0.2 0.4 ]
skyAngle [ 1.309, 1.571 ]
skyColor [ 0.1 0.1 0.4, 0.1 0.125 0.4, 0.1 0.1 0.3 ]
}

Viewpoint {
  description "Amphibious raid - full scenario seen from above"
  orientation -0.557 -0.799 -0.229 0.9506
  position -600 10000 25000
}

Viewpoint {
  description "1000m elevation view"
  orientation 0 1 0 -0.78
  position -200 1000 22000
}

Transform {
  rotation 0 0 1 .1
  children [
    Viewpoint {
      description "Waypoint"
      orientation 0 1 0 1.57
      position 9451 20 14935
    }
    Viewpoint {
      description "waypoint 2"
      orientation 0 1 0 1.57
      position 11217.2 10.0 13996.6
    }
  ]
}

# ViewPositionOrientation is a prototype lets us find good viewpoints for inclusion in the scene
ViewPositionOrientation {
  enabled TRUE
}
# This is a hack to orient camera to scene. Actually, scene elements need to be rotated.

Transform {
  rotation 0 1 0 1.57
  children [
    CameraCompass36 {
      enabled TRUE
      positionOffsetFromCamera 0 5 0
      markerColor 0.9 0.9 0.9
      labelColor 0.9 0.9 0.9
    }
  ]
}

DEF CobraCapStartingPoint HiddenViewpoint {
  position 6530 18 16800
  rotation 0 1 0 -0.1
  sensorRadius 100
  label [ "Cobra CAP" "starting point" "6530 11.5 16800" ]
  labelOffset 0 -2 0
  labelFontSize 0.5
  labelColor 1 0.5 0
}

DEF CobraCapInitialClimb HiddenViewpoint {
  position 6530 500 16800
  rotation 0 1 0 -0.4
  sensorRadius 100
  label [ "Cobra CAP" "initial climb point" "6530 500 16800" ]
  labelOffset 0 1 0
  labelFontSize 0.5
  labelColor 1 0.5 0
}

DEF SouthernCapTurnPoint HiddenViewpoint {
  position 25400 500 19100
  rotation 0 1 0 0.4
}
sensorRadius 200
label [ "Cobra CAP" "Southern Turn Point" "" "25400 500 191000" ]
labelOffset 0 1 0
labelFontSize 0.5
labelColor 1 0.5 0
}
DEF NorthernCapTurnPoint HiddenViewpoint {
  position 5100 500 700
  rotation 0 1 0 -2.3
  sensorRadius 200
  label [ "Cobra CAP" "Northern Turn Point" "" "5100 500 700" ]
  labelOffset 0 1 0
  labelFontSize 0.5
  labelColor 1 0.5 0
}
Switch {
  whichChoice 0
  choice [ DEF EntireScene Group {
  children [ Transform {
    children [ Inline {
      url [ "file:///C:/jakarta-tomcat-3.2.3/webapps/cocoon/samples/vrml/Savage/Locations/CampPendletonCalifornia/CampPendletonOperatingAreasExample.xml"
      "http://web.nps.navy.mil/~brutzman/Savage/Locations/CampPendletonCalifornia/CampPendletonOperatingAreasExample.xml"
      "file:///C:/jakarta-tomcat-3.2.3/webapps/cocoon/samples/vrml/Savage/Locations/CampPendletonCalifornia/CampPendletonOperatingAreasExample.xml"
      "http://web.nps.navy.mil/~brutzman/Savage/Locations/CampPendletonCalifornia/CampPendletonOperatingAreasExample.xml"
  }]
}]
}]
}
"http://web.nps.navy.mil/~brutzman/Savage/Locations/CampPendletonCalifornia/CampPendletonOperatingAreasExample.xml"
}
]
}
]
DEF LPD Transform {
  translation 6600 10 16800
  children [
    Inline {
      "file:///C:/jakarta-tomcat-3.2.3/webapps/cocoon/samples/vrml/Savage/Ships/LandingPlatformDock-LPD/LPD.wrl"
      "file:///C:/jakarta-tomcat-3.2.3/webapps/cocoon/samples/vrml/Savage/Ships/LandingPlatformDock-LPD/LPD.xml"
      "http://web.nps.navy.mil/~brutzman/Savage/Ships/LandingPlatformDock-LPD/LPD.xml"
    }
  ]
}
]
]
DEF AAAV1_Clock TimeSensor {
  loop TRUE
}

DEF AAAV_1_WaypointInterpolator WaypointInterpolator {
  # need to improve elevations on beach (final waypoint)
  # 1 knot = 0.514444444 meters/second
  wayPoints [ 6802 1 16343
  7685.0 1.0 15873.7,
  8568.1 1.0 15404.4,
  9451.1 1.0 14935.2,
  10334.2 1.0 14465.9,
}
11217.2 1.0 13996.6,
12100.3 1.0 13527.3,
12983.3 1.0 13058.0,
13866.4 1.0 12588.7,
14749.4 1.0 12119.5,
15632.5 1.0 11650.2,
16515.5 1.0 11180.9,
17398.6 1.0 10711.6,
18281.6 1.0 10242.3,
19164.7 1.0 9773.1,
19400.0 1.0 9648.0,
19782 1 9185
20100 10 8800

} defaultSpeed 50
lineColor 0.8 0.8 0
labelColor 0.8 0.8 0
labelOffset 0 3 0
labelFontSize 1.5
traceEnabled FALSE
Transform {
  translation 6600 0 16800
}
DEF AAAV-Location EspduTransform {
  readInterval 0
  traceOffset 0 4 0
  traceSize 2 2 2
  translation 6600 0 16800
  writeInterval 1
  children [
    Group {
children [
Viewpoint {
    description "AAAV raid from behind"
    orientation 0 1 0 -1.57
    position -40 2 0
}
Viewpoint {
    description "AAAV raid from ahead"
    orientation 0 1 0 1.57
    position 50 12 0
}
DEF VerticalCorrection Transform {
    translation 0 -4 0
    children [
    DEF AAAV Inline {
        url "file:///C:/jakarta-tomcat-3.2.3/webapps/cocoon/samples/vrml/Savage/AmphibiousVehicles/AAAV/AAAV.wrl"
        "../../AmphibiousVehicles/AAAV/AAAV.wrl"
        "http://web.nps.navy.mil/~brutzman/Savage/AmphibiousVehicles/AAAV/AAAV.wrl"
        "file:///C:/jakarta-tomcat-3.2.3/webapps/cocoon/samples/vrml/Savage/AmphibiousVehicles/AAAV/AAAV.xml"
        "../../AmphibiousVehicles/AAAV/AAAV.xml"
        "http://web.nps.navy.mil/~brutzman/Savage/AmphibiousVehicles/AAAV/AAAV.xml"
    }
}
}
DEF OtherAAAVs Group {
    children [
    Transform {
        translation -15 -4 15
        children [
        DEF AAAV-2 Transform {
            children [
            ”

260
USE AAAV

DEF AAV-2PATH PositionInterpolator {
  key [ 0.00, 0.11, 0.17, 0.22,
        0.33, 0.44, 0.50, 0.55,
        0.66, 0.77, 0.83, 0.88,
        0.99 ]
  keyValue [ 0.0 0.0 0.0, 1.0 0.96 1.0,
            1.5 0.21 1.5, 2.0 0.96 2.0,
            3.0 0.0 3.0, 2.5 0.96 3.0,
            1.75 0.41 3.0, 1.0 0.96 3.0,
            3.0 0.0 3.0, 2.0 0.46 2.0,
            1.0 0.4 1.5, 0.0 0.46 1.0,
            0.0 0.0 0.0 ]
}

ROUTE AAV-2PATH.value_changed TO AAAV-2.set_translation

}]

Transform {
  translation -15 -4 -17.5
  children [DEF AAAV-3 Transform {
    children [USE AAAV
      DEF AAV-3PATH PositionInterpolator {
        key [ 0.00, 0.07, 0.13, 0.22,
           0.36, 0.47, 0.55, 0.625,
           0.66, 0.72, 0.80, 0.85,
           0.99 ]
        keyValue [ 0.0 0.0 0.0, 1.0 0.96 1.0,
                      1.5 0.21 2.25, 2.0 0.46 2.66,
                      3.0 -0.25 3.0, 2.5 0.96 3.0,
                      1.75 0.41 3.0, 1.0 0.96 3.0,
                      3.0 0.0 3.0, 2.0 0.46 2.0,
                      1.0 0.4 1.5, 0.0 0.46 1.0,
                      0.0 0.0 0.0 ]
    }]
  }]
}]

261
DEF Helo-1 Transform {
  translation 6530 11.5 16800
  children [
    DEF HeloInstance1 AHlSuperCobra {
      helicopterName "Cobra CAP 1"
      tailBoomColor
        DEF GREY_APPEARANCE Appearance {
          material Material {
            diffuseColor 0.5 0.5 0.5
          }
        }
      tailRotorDriveShaftColor
        USE GREY_APPEARANCE Appearance {
          material Material {
            diffuseColor 0.5 0.5 0.5
          }
        }
      horizontalStabilizerColor
        Appearance {
          material Material {
            diffuseColor 0.5 0.5 0.5
          }
        }
      fuselageColor
        Appearance {
          material Material {
            diffuseColor 0.6 0.6 0.6
          }
        }
    }
  ]
}

ROUTE AAV-3PATH.value_changed TO AAAV-3.set_translation

}
cockpitColor  Appearance {
    material Material {
        diffuseColor 0.6 0.6 0.6
    }
}
cowlingColor  Appearance {
    material Material {
        diffuseColor 0.5 0.5 0.5
    }
}
inFlight FALSE

DEF Helo_1_WaypointInterpolator WaypointInterpolator {
    # 1 knot = 0.514444444 meters/second
    wayPoints  [ 6600 600 16800
7592.6 600 16921.4
8585.2 600 17042.9
9577.8 600 17164.3
10570.4 600 17285.7
11563.0 600 17407.2
12555.6 600 17528.6
13548.2 600 17650.0
14540.8 600 17771.5
15533.4 600 17892.9
16526.0 600 18014.4
17518.6 600 18135.8
18511.2 600 18257.2
19503.8 600 18378.7
20496.4 600 18500.1
}
<table>
<thead>
<tr>
<th>Value 1</th>
<th>Value 2</th>
<th>Value 3</th>
<th>Value 4</th>
<th>Value 5</th>
<th>Value 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>21489.0</td>
<td>600</td>
<td>18621.5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22481.6</td>
<td>600</td>
<td>18743.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23474.2</td>
<td>600</td>
<td>18864.4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24466.8</td>
<td>600</td>
<td>18985.8</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25400</td>
<td>600</td>
<td>19100</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24906.2</td>
<td>600</td>
<td>18230.4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24412.4</td>
<td>600</td>
<td>17360.9</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23918.5</td>
<td>600</td>
<td>16491.3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23424.7</td>
<td>600</td>
<td>15621.8</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22930.9</td>
<td>600</td>
<td>14752.2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22437.1</td>
<td>600</td>
<td>13882.6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21943.2</td>
<td>600</td>
<td>13013.1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21449.4</td>
<td>600</td>
<td>12143.5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20955.6</td>
<td>600</td>
<td>11273.9</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20800</td>
<td>600</td>
<td>11000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20072.7</td>
<td>600</td>
<td>10313.7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19345.4</td>
<td>600</td>
<td>9627.4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18618.1</td>
<td>600</td>
<td>8941.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17890.8</td>
<td>600</td>
<td>8254.7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17163.5</td>
<td>600</td>
<td>7568.4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16436.2</td>
<td>600</td>
<td>6882.1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15708.9</td>
<td>600</td>
<td>6195.7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14981.6</td>
<td>600</td>
<td>5509.4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14254.3</td>
<td>600</td>
<td>4823.1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13700</td>
<td>600</td>
<td>4300</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12777.6</td>
<td>600</td>
<td>3913.9</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11855.1</td>
<td>600</td>
<td>3527.7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10932.7</td>
<td>600</td>
<td>3141.6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10010.2</td>
<td>600</td>
<td>2755.4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9087.8</td>
<td>600</td>
<td>2369.3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8165.4</td>
<td>600</td>
<td>1983.2</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
7242.9 600 1597.0
6320.5 600 1210.9
5398.0 600 824.8
5100 600 700

5192.8 600 1695.7
5285.5 600 2691.4
5378.3 600 3687.1
5471.1 600 4682.8
5563.8 600 5678.4
5656.6 600 6674.1
5749.4 600 7669.8
5842.1 600 8665.5
5934.9 600 9661.2
6027.7 600 10656.9

6120.4 600 11652.6
6213.2 600 12648.3
6306.0 600 13643.9
6398.7 600 14639.6
6491.5 600 15635.3
6584.3 600 16631.0
6600 600 16800 ]
defaultSpeed 100
pitchUpDownForVerticalWayPoints FALSE
lineColor 0 0.8 0
labelColor 0 0.8 0
labelOffset 0 5 0
labelFontSize 3
traceEnabled FALSE
}
DEF Helol_Clock TimeSensor {
  loop TRUE
}
DEF Helo-2 Transform {
  translation 6600 50 16800
  children [
    Transform {
      children [
        DEF HeloInstance2 AH1SuperCobra {
          helicopterName "Cobra CAP 2"
          tailBoomColor Appearance {
            material Material {
              diffuseColor 0.5 0.5 0.5
            }
          }
          tailRotorDriveShaftColor Appearance {
            material Material {
              diffuseColor 0.5 0.5 0.5
            }
          }
          horizontalStabilizerColor Appearance {
            material Material {
              diffuseColor 0.5 0.5 0.5
            }
          }
          fuselageColor Appearance {
            material Material {
              diffuseColor 0.6 0.6 0.6
            }
          }
          cockpitColor Appearance {
            material Material {
              diffuseColor 0.6 0.6 0.6
            }
          }
          cowlingColor Appearance {
            material Material {
              diffuseColor 0.6 0.6 0.6
            }
          }
        }
      ]
    }
  ]
}
diffuseColor 0.5 0.5 0.5
}
}
inFlight TRUE
}
]
]
]
]
}
DEF Helo_2_WaypointInterpolator WaypointInterpolator {
  # 1 knot = 0.514444444 meters/second
  wayPoints [ 6530 11.5 16800
               6530 500 16800
               6600 500 16800
               7592.6 500 16921.4
               8585.2 500 17042.9
               9577.8 500 17164.3
               10570.4 500 17285.7
               11563.0 500 17407.2
               12555.6 500 17528.6
               13548.2 500 17650.0
               14540.8 500 17771.5
               15533.4 500 17892.9
               16526.0 500 18014.4
               17518.6 500 18135.8
               18511.2 500 18257.2
               19503.8 500 18378.7
               20496.4 500 18500.1
               21489.0 500 18621.5
               22481.6 500 18743.0
               23474.2 500 18864.4
               24466.8 500 18985.8

5192.8 500 1695.7
5285.5 500 2691.4
5378.3 500 3687.1
5471.1 500 4682.8
5563.8 500 5678.4
5656.6 500 6674.1
5749.4 500 7669.8
5842.1 500 8665.5
5934.9 500 9661.2
6027.7 500 10656.9
6120.4 500 11652.6
6213.2 500 12648.3
6306.0 500 13643.9
6398.7 500 14639.6
6491.5 500 15635.3
6584.3 500 16631.0
6600 500 16800 ]
defaultSpeed 200
lineColor 0.8 0 0
labelColor 0.8 0 0
labelOffset 0 5 0
labelFontSize 3
traceEnabled FALSE
}
DEF Helo2_Clock TimeSensor {
    loop TRUE
}
DEF AAV7PA1Location Transform {
    scale 1.25 1.25 1.25
    translation 6620 -2 16900
    children [
    Inline {

DEF AAV7PA1WaypointInterpolator WaypointInterpolator {
    # 1 knot = 0.514444444 meters/second
    wayPoints  [ 6620 -1 16900
    6720 -1 16900
    6870 -1 19500
    7400 -1 19500
    8400 -1 16900
    6620 -1 16900 ]
    defaultSpeed 5
    lineColor 0.8 0 0.65
    labelColor 0.8 0 0
    labelOffset 0 5 0
    labelFontSize 3
    traceEnabled FALSE
}
DEF AAV7PA1Clock TimeSensor {
    loop TRUE
}
}
ROUTE AAAV1_Clock.fraction_changed TO AAAV_1_WaypointInterpolator.fraction
ROUTE AAAV_1_WaypointInterpolator.totalDuration TO AAAV1_Clock.cycleInterval
ROUTE AAAV_1_WaypointInterpolator.positionValue TO AAAV-Location.set_translation
ROUTE AAAV_1_WaypointInterpolator.orientationValue TO AAAV-Location.set_rotation
Switch {
    whichChoice 0
    choice [
        Transform {
            rotation 0 1 0 1.5708
            translation 11900 0 6000
            children [
                Inline {
                    url [ "file:///C:/jakarta-tomcat-3.2.3/webapps/cocoon/samples/vrml/Savage/Locations/CampPendletonCalifornia/ChartletTranscribed.wrl" 
                        "../../../Locations/CampPendletonCalifornia/ChartletTranscribed.xml"
                        "file:///C:/jakarta-tomcat-3.2.3/webapps/cocoon/samples/vrml/Savage/Locations/CampPendletonCalifornia/ChartletTranscribed.xml"
                        "http://web.nps.navy.mil/~brutzman/Savage/Locations/CampPendletonCalifornia/ChartletTranscribed.xml"
                }
            ]
        }
    ]
}
}

Group {
    # Southwest corner reference point: 33:12N 117:38W
    # GeoLocation and USE EntireScene to follow
}
}

# AAAV-1 Waypoint Routes
# Helo-1 Waypoint Routes
ROUTE Helo1_Clock.isActive TO HeloInstance1.inFlight
ROUTE Helo_1_WaypointInterpolator.totalDuration TO Helo1_Clock.cycleInterval
ROUTE Helo1_Clock.fraction_changed TO Helo_1_WaypointInterpolator.fraction
ROUTE Helo_1_WaypointInterpolator.positionValue TO Helo-1.set_translation
ROUTE Helo_1_WaypointInterpolator.orientationValue TO Helo-1.set_rotation

# Helo-2 Waypoint Routes
ROUTE Helo2_Clock.isActive TO HeloInstance2.inFlight
ROUTE Helo_2_WaypointInterpolator.totalDuration TO Helo2_Clock.cycleInterval
ROUTE Helo2_Clock.fraction_changed TO Helo_2_WaypointInterpolator.fraction
ROUTE Helo_2_WaypointInterpolator.positionValue TO Helo-2.set_translation
ROUTE Helo_2_WaypointInterpolator.orientationValue TO Helo-2.set_rotation

# AAV2
ROUTE AAAV1_Clock.fraction_changed TO AAV-2PATH.set_fraction

# AAV7PA1 Waypoint Routes
ROUTE AAV7PA1WaypointInterpolator.totalDuration TO AAV7PA1Clock.cycleInterval
ROUTE AAV7PA1Clock.fraction_changed TO AAV7PA1WaypointInterpolator.fraction
ROUTE AAV7PA1WaypointInterpolator.positionValue TO AAV7PA1Location.set_translation
ROUTE AAV7PA1WaypointInterpolator.orientationValue TO AAV7PA1Location.set_rotation

<!-- This is the end of the WRL file code -->
</vrml>
</page>
Cocoon web-publishing framework

X3D Selection Servlet Application

This page is currently set up to support X3D XML documents. The X3DCoocon Servlet is called which call the DTD, Xml Parser, X3D documents and X3D stylesheets use to convert the X3d XML Documents to VRML, HTML, or XML document (Cocoon Wrapper).

Select XML Document.

- HelloWorld.xml
- KelpForest.xml
- AmphibiousRaid.xml
The program uses Servlet which can be easily setup to call any XML document and apply any stylesheets to convert the XML output.

The program uses Servlet which can be easily setup to call any XML document and apply any stylesheets to convert the XML output.
K. X3DtoVRML97.XSL

<?xml version='1.0'?>
<xsl:stylesheet xmlns:xsl="http://www.w3.org/1999/XSL/Transform" version="1.0"
    xmlns:saxon="http://icl.com/saxon" saxon:trace="no">
<!-- Edited with XML Spy v4.0 U (http://www.xmlspy.com) by Clifton Williams (Naval Postgraduate School) to be used with cocoon
    and add a wrapper. X3dToVrml97 fto allow X3dCoocon Servlet control the output to XML function and Text output -->
<!-- XSL namespaces are in transition! Tools are slow to catch up.
    *** Edit the topmost stylesheet tag on line 2 of this file to match the xmlns namespace URI for your XSL tool. ***
W3C:
    Saxon: <xsl:stylesheet xmlns:xsl="http://www.w3.org/1999/XSL/Transform">
IBM XSLEditor: <xsl:stylesheet xmlns:xsl="http://www.w3.org/XSL/Transform/1.0">
IE 5: <xsl:stylesheet xmlns:xsl="http://www.w3.org/TR/WD-xsl">
XT: <xsl:stylesheet xmlns:xsl="http://www.w3.org/XSL/Transform">-->
<!--
<head>
<meta name="filename" content="X3dToVrml97.xsl" />
<meta name="author" content="Don Brutzman" />
<meta name="revised" content="22 July 2001" />
<meta name="description" content="XSL stylesheet to convert X3D files to VRML 97 format, fourth draft matching x3d-compromise.dtd" />
<meta name="url" content="http://www.web3D.org/TaskGroups/x3d/translation/X3dToVrml97.xsl" />
</head>
Recommended tool:
- SAXON XML Toolkit (and Instant Saxon) from Michael Kay of ICL, http://users.iclway.co.uk/mhkay/saxon
- Can also be used with Apache server
-->
<!-- Problems and bugs:
- Script node content hardwired for javascript to eliminate problematic leading whitespace (which crashes CosmoPlayer)
- still need to check KeySensor, StringSensor, GeoVRML attribute defaults
275
- combine GeoVRML and H-Anim metadata attributes into a single string
- ensure Double types get translated properly!

```xml
<xsl:strip-space elements="*" />  
<xsl:output method="text" encoding="utf-8" media-type="model/vrml" indent="no" cdata-section-elements="Script"/>
<!-- omit-xml-declaration="yes" -->
<!-- indent handled as a passed parameter since output-tag indent ineffective -->
<!-- ****** root: start of file ****** -->
<xsl:template match="/">
  <!-- VRML 97 header -->
  <xsl:text>#VRML V2.0 utf8&#10;# X3D-to-VRML-97 XSL translation autogenerated by X3dToVrml97.xsl&#10;# http://www.web3D.org/TaskGroups/x3d/translation/X3dToVrml97.xsl&#10;&amp;#10;</xsl:text>
  <!-- VRML 200x headers -->
  <xsl:apply-templates select="X3D"/>
  <xsl:apply-templates select="X3D/component"/>
  <xsl:if test="X3D/head">
    <xsl:text>&#10;</xsl:text>
    <xsl:apply-templates select="X3D/head"/>
    <xsl:text>&#10;</xsl:text>
  </xsl:if>
  <!-- Insert GeoVrml EXTERNPROTO declarations, if not otherwise provided -->
  <xsl:if test="//GeoCoordinate and not(//ExternProtoDeclare[@name='GeoCoordinate']) and
              not(//ProtoDeclare[@name='GeoCoordinate'])">
    <xsl:text>EXTERNPROTO GeoCoordinate [&#10;</xsl:text>
    <xsl:text>  field SFNode geoOrigin # NULL&amp;#10;]</xsl:text>
    <xsl:text>field MFString geoSystem # [ "GDC" ]&amp;#10;</xsl:text>
    <xsl:text>field MFString point # []&amp;#10;</xsl:text>
    <xsl:text>] [&amp;#10;]
    <xsl:text>"C:\Program Files\GeoVRML\1.0\protos\GeoCoordinate.wrl#GeoCoordinate"&amp;#10;</xsl:text>
    <xsl:text>"file://C:\Program Files/GeoVRML/1.0/protos/GeoCoordinate.wrl#GeoCoordinate"&amp;#10;</xsl:text>
    <xsl:text>"urn:web3d:geovrml:1.0/protos/GeoCoordinate.wrl#GeoCoordinate"&amp;#10;</xsl:text>
    <xsl:text>"http://www.geovrml.org/1.0/protos/GeoCoordinate.wrl#GeoCoordinate"&amp;#10;</xsl:text>
  </xsl:if>
</xsl:template>
```
LIST OF REFERENCES


[JVM01] Java Virtual Machine (JVM) in the Java 2 Software Development Kit Package J2SDK-1_3_1_01 http://java.sun.com/j2se/1.3/install-windows.html, Sun Microsystems, Inc


Microsoft XML Parser (MSXML) version 4.0

Nicklaus, Shane, *Scenario Authoring And Visualization For Advanced Graphical Environments* (Savage), Master’s Thesis, Naval Postgraduate School, Monterey, California, USA, June 2001.


Saxon XSLT Processor, Michael Kay http://saxon.sourceforge.net/


INITIAL DISTRIBUTION LIST

1. Defense Technical Information Center .................................................................2
   8725 John J. Kingman Road, Suite 0944
   Ft. Belvoir, VA  22060-6218

2. Dudley Knox Library .............................................................................................2
   Naval Postgraduate School
   411 Dyer Road
   Monterey, CA  93943-5101

3. Dan Dolk, Code IS .................................................................................................1
   Naval Postgraduate School
   Monterey, CA 93940-5000

4. LCDR Raymond Buettner, Code IW .................................................................1
   Naval Postgraduate School
   Monterey, CA 93940-5000

5. Mr. Arison ............................................................................................................1
   JCS/J6
   Pentagon
   Washington, D.C. 20350-2000

6. Dr. Michael P. Bailey ............................................................................................1
   Technical Director, Marine Corps Training and Education Command
   Commanding General
   Marine Corps Combat Development Command, Code 46T
   3300 Russell Road
   Quantico, VA 22134

7. Dr. Philip S. Barry ...............................................................................................1
   Chief, S&T Initiatives Division
   Defense Modeling and Simulation Office
   1901 N. Beauregard Street, Suite 500
   Alexandria VA 22311

8. Robert J Barton III ..............................................................................................1
   Fraunhofer Center for Research in Computer Graphics (CRCG)
   321 South Main St
   Providence, RI 02903
9. Curtis Blais
   Institute for Joint Warfare Analysis
   Naval Postgraduate School
   Monterey, CA 93940-5000

10. Gordon Bradley
    Naval Postgraduate School
    Monterey, CA 93940-5000

11. Don Brutzman, Code UW/Br
    Naval Postgraduate School
    Monterey, CA 93940-5000

12. Dan Boger, Code C3/Bo
    Naval Postgraduate School
    Monterey, CA 93940-5000

13. Rex Buddenberg Code IS/Bu
    Naval Postgraduate School
    Monterey, CA 93940-5000

14. Fred Burkley
    NAVSEA Undersea Warfare Center
    Division Newport
    Code 2231, Bldg 1171-3
    1176 Howell Street
    Newport, RI 02841-1708

15. Bob Cabanya
    Information Operations, Inc.
    1298 Bay Dale Dr.
    Arnold, MD 21012

16. LTC Neil Cadwallader
    MCTSSA, Box 555171
    Camp Pendleton, CA 92055-5171

17. Erik Chaum
    NAVSEA Undersea Warfare Center
    Division Newport
    Code 2231, Building 1171-3
    1176 Howell Street
    Newport, RI 02841-1708
18. Rober Clover............................................................................................................1
Institute for Defense Analyses
1801 N. Beauregard St.
Alexandria, VA 22311-1772

19. Colonel William Crain, USA...................................................................................1
Defense Modeling and Simulation Office
1901 N. Beauregard St. Suite 500
Alexandria, VA 22311

20. Justin Couch and Alan Hudson................................................................................1
Yumatech, Inc
600 Malden Ave. East
Suite 202
Seattle, WA 98112

21. Dr. Paul Fishwick.....................................................................................................1
Computer & Information Science and Engineering Department
University of Florida
Post Office Box 115120
322 Building CSE
Gainsville, FL 32611-6120

22. Dr. Tony Healey, Code ME/Hy ...............................................................................1
Naval Postgraduate School
Monterey, CA 93943-5101

23. Captain Mike Hunsberger, USAF............................................................................1
Air Force Communications Agency/TCPD
203 Lossey St
Scott AFB, IL 62225

24. Pamela Krause .........................................................................................................1
Advance Systems & Technology
National Reconnaissance Office
14675 Lee Rd
Chantilly, VA 20151-1714

25. S. David Kwak.........................................................................................................1
The Mitre Corporation – M/S B155
202 Burlington Rd.
Bedford, MA 01730-1420
26. John Lademan
Electronic Sensors and Systems Sector
Northrop Grumman Corporation
PO Box 1488 – MS 9030
Anapolis, MD 21404

27. Major Dave Laflam, USA
Army Model and Simulation Office
Office of the Deputy Chief of Staff for Operations and Plans
1111 Jefferson Davis Highway
Crystal Gateway North (Suite 503E)
Arlington, VA 22202

28. Dr. Francisco Loaiza and Dr. Eugene Simaitis
Institute for Defense Analyses
Systems Evaluation Division
1801 N. Beauregard St.
Alexandria, VA 22311

29. Dr. R Bown Loftin
Director of Simulation Programs
Virginia Modeling Analysis & Simulation Center
Old Dominion University
7000 College Dr
Suffolk, VA 23435

30. Dell Lunceford
Director, Army Model & Simulation Office
Crystal Gateway North Suite 503E
1111 Jefferson Davis Highway
Arlington, VA 22202

31. Mike Macedonia
Chief Scientist and Technical Director
US Army STRICOM
12350 Research Parkway
Orlando, FL 32826-3276

32. Fahrid Mamaghani
19223 SE 45th St
Issaquah, WA 98027
33. Capt. Maslowsky
CNO/N62
Pentagon
Washington, D.C. 20350-2000

34. Michael McCann
Monterey Bay Aquarium Research Institute (MBARI)
PO Box 628
Moss Landing, CA 95039-0628

35. Chuck Mirabile
USMC Program Office, D12
52560 Hull St.
San Diego, CA
92152-5001

36. Capt Mark Murray USAF
Joint Battlespace Infosphere (JBI)
AFRL/IFSE
Building 3, Room E-1078
525 Brooks Road
Rome, NY 13441-4505

37. Michael Myjak
Vice President and CTO
The Virtual Workshop
PO Box 98
Titusville, FL 32781

38. Neal Park, President
Nexternet, Inc.
2900 Gordon Ave.
Suite 202
Santa Clara, CA 95051

39. Marty Paulsen
Analytic Graphics, Inc.
3760 Killroy Airport Way
Suite 270
Long Beach, CA 90806
40. George Philips..........................................................................................................1
   CNO, N6M1
   2000 Navy Pentagon
   Room 4C445
   Washington, DC 20350-2000

41. David Pratt ...............................................................................................................1
   SAIC

42. Dr. Mark Pullen & Dr. Robert Simon......................................................................2
   Department of Computer Science/C3I Center MS4A5
   George Mason University
   FairFax, VA 22030

43. Dick Puk................................................................................................................... 1
   President
   Intelligraphics Incorporated
   7644 Cortina Court
   Carlsbad, CA 92009-8206

44. CAPT Jason Quigley USAF ....................................................................................1
   Joint Battlespace Infosphere (JBI)
   AFRL/IFSE
   Building 3, Room E-1078
   525 Brooks Road
   Rome, NY 13441-4505

45. Dr. Martin Reddy .....................................................................................................1
   SRI International, EK219
   333 Ravenswood Avenue
   Menlo Park, CA 94025

46. Dr. R. Jay Roland, President....................................................................................1
   Rolands and Associates
   500 Sloat Avenue
   Monterey CA 93940

47. RADM Paul Sullivan, USN.....................................................................................1
   Director, Submarine Warfare Division N77
   2000 Navy Pentagon, 4D542
   Washington, DC 20350-2000
48. Craig Swanson
Science Applications International Corporation
Information Systems Division
1710 SAIC Dr.
McLean, VA 22102

49. CAPT Robert Voigt, USN
Chair, Electrical Engineering Department
U.S. Naval Academy
Annapolis, MD 21402

50. Joe Williams
3421 Bonita Vista Lane
Santa Rosa, CA 95404

51. Lt. Col. Ziegenfuss
HQMC C4I Plans and Policy Division
2 Navy Annex
Washington, D.C. 20380-1775

52. Walter H. Zimmers
Defense Threat Reduction Agency
CPOC
6801 Telegraph Road
Alexandria VA 22310-3398

53. Dr. Michael Zyda, CodeCS/Zk
Director, Modeling Virtual Environments and Simulation (MOVES) Institute
Computer Science Department
Naval Postgraduate School
Monterey, CA 93940-5000

55. Lieutenant Clifton J. Williams
1717 Abadie Ave
Metairie, LA 70003